

# Encyclopedia of Portal Technologies and Applications

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# The Effects of Enterprise Portals on Knowledge Management Projects

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## INTRODUCTION

In an attempt to consolidate various departmental intranets, organizations are constructing corporate intranets or portals (Choo, Detlor, & Turnbull, 2000). They are becoming single points of entry through which users and communities can perform their business tasks, and also evolving into virtual places where people can get in touch with other people who share common interests. Due to this evolution from intranets towards portals, many organizations are using them as the major technological infrastructure of their knowledge management (KM) initiatives. KM studies analyze people, organizations, processes and technology. Although technology is not the main component of KM, it would be naive to implement KM without considering any technological support. KM is of particular relevance to information science and information system research because technologies play a critical role in shaping organizational efforts for knowledge creation, acquisition, integration, valuation, and use (Sambarmurthy & Subramani, 2005).

The purpose of this article is to present a model which may be useful to help organizations in understanding the impacts of portal initiatives on KM initiatives. The research model, that is presented a little later, was based on TAM (technology acceptance model), TTF (task technology fit) and knowing organization model (Choo, 1998), and was tested in 98 Brazilian and 70 Portuguese organizations.

## BACKGROUND

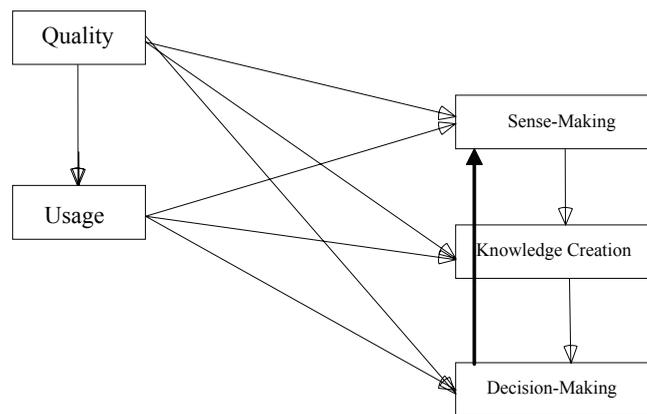
Many of the existing proposals for portal evaluation (Delphi Group, 2000; Firestone, 2003; Terra & Gordon, 2002) place more emphasis on the technological aspects rather than on

organizational issues. Indeed, most of the mentioned proposals do not leverage classical studies that exist on information science and information systems literature. Perceiving the portal as a specific type of information system is a way of exploiting previous studies related to user behavior, technology acceptance and its organizational impact.

The TAM model was developed to explain and predict computer usage behaviour (Davis, 1989). The TAM has received substantial theoretical and empirical support from hundreds of studies, becoming a generally accepted cognitive model for predicting user IT acceptance (Detlor, 2004). The TAM has two variables influencing attitudes and use: perceived usefulness and perceived ease of use. *Perceived usefulness* is defined as the degree to which a person believes that using a particular system would enhance his or her job performance. In contrast, *perceived ease of use* refers to the degree to which a person believes that using a particular system would be free of effort (Davis, 1989).

According to the TTF model (Goodhue & Thompson, 1995), a technology has a positive impact on individual performance when it is utilized and has a good fit with the tasks it supports. A combination of TTF and TAM into one extended model has proven to be a superior model to either the TAM or the TTF model alone (Dishaw & Strong, 1999). Therefore, the portal quality construct presented in this article will use concepts from both models, adapting them to the portal's context. For different reasons, the following TTF factors have not been taken into account for the development of the quality construct: TTF3 (Authorization), TTF6 (Production timeliness), TTF7 (Reliability), and TTF8 (Relationship with users). TTF3 is not a critical issue for portals, which are usually accessible to all the users within the organization. TTF6 and TTF8 are beyond the scope of this research in that portal managers will be

Figure 1. Research model



involved. Finally, TTF7 was eliminated due to the high predictability of portal environment. As the amount of users is usually known by the organization, it is quite easy to scale the system to support the demand in a reliable manner. On the other hand, the factors TTF1(accuracy, novelty), TTF2(Locatability), TTF4(Compatibility), and TTF5(Ease of use) were incorporated into the quality construct. The quality dimensions comprised by TTF1 are fundamental because information retrieval is the most basic motivation for portals. Analogously, TTF2 is also critical, because it will be worthless to have high quality information if users are not able to find or understand its meaning. TTF4 was kept in construct because one of the greatest portal challenges is to integrate heterogeneous IS. TTF5 was chosen for being a TTF factor and a TAM variable.

As the research objective is to analyze the effects of portals on KM initiatives, it is necessary to provide some background concerning KM. In fact, KM intends to be an area of research and practice that deepens the understanding of knowledge processes in organizations, and develops procedures and instruments to support the transformation of knowledge into economic and social progress (Carvalho & Ferreira, 2001). In order to establish a more consistent link between information and knowledge processes, the knowing organization model (Choo, 1998) will be adopted as a theoretical background. This framework describes organizations as systems where the processes of sense-making, knowledge creating and decision-making are continuously interacting.

Sense-making is related to how the organization interprets and makes sense of its changing environment which leads to shared meanings and intent. Knowledge creation is accomplished through the conversion and sharing of different forms of organizational knowledge, resulting in new capabilities and innovation. Finally, the organization processes and

analyses information through the use of rules and routines that reduce complexity and uncertainty (Choo, 1998).

## THE RESEARCH MODEL

The following research model has been designed to analyze the relationships between portal quality and portal usage with the three dimensions of the knowing organization model. Figure 1 provides a graphical representation of the research model.

The research model has five constructs: portal quality, portal usage, sense-making, knowledge creation and decision-making. The research model's variables were translated into a Web-based questionnaire using Likert-type scales (0-10) with the extremes "totally disagree" and "totally agree". None of the questions were written in a negative manner, therefore the value 10 always means the most advanced level of the practice being evaluated. The quality construct was based on TAM and TTF models, and its variables are described in Table 1.

The usage construct was conceived to evaluate how frequently users access portal features, and its variables are described in Table 2.

The questions related to usage construct allow respondents to answer "not available" if the feature was not present on the intranet. This procedure was used to distinguish between inexistence of features and very low usage of existing features. The 11-point Likert-type scale was presented with the extremes "(0)—very rare usage (once a month or less)" and "(10)—very frequent usage (more than 5 hours per day)" in order to guide respondents. Additionally, the middle of the scale (value 5) had a label "between one half and 1 hour per day".

Table 1. Variables of the quality construct

Variable	Inspiration	Question
(q1)Quality of information	TTF1	The intranet maintains accurate and up-to-date information at an appropriate level of detail sufficient for users to carry out their tasks.
(q2)Locatability	TTF2	It is easy to determine what information is available on the intranet and locate it.
(q3)Meaning of information	TTF2	The exact meaning of information available on the intranet is either obvious, or easy to find out.
(q4)Compatibility	TTF4	The intranet supports comparison and consolidation of information from different sources, without generating unexpected or difficult inconsistencies.
(q5)Productivity increase	TAM	The intranet enables users to accomplish tasks more quickly, increasing their productivity.
(q6)Job facilitator	TAM	The intranet makes it easier for users do their jobs.
(q7)Job quality gain	TAM	The intranet enables users to improve the quality of their work.
(q8)Usefulness	TAM	Overall, users find the intranet useful in their jobs.
(q9)Ease of training	TAM	Users quickly learn how to operate the intranet to perform their tasks.
(q10)Ease of use	TAM; TTF5	Overall, users find the intranet easy to use.

Table 2. Variables of the usage construct

Variable	Question
(u0)General usage	On an average working day, how much time do you spend using the intranet?
(u1)Non-structured information sources	How frequently do you use the intranet to access non-structured information sources (documents, project reports, product information)?
(u2)Structured information sources	How frequently do you use the intranet to access to structured information sources (databases, ERP, data warehouse, legacy systems)?
(u3)Collaboration	How frequently do you use the intranet to access collaboration tools?
(u4)e-learning	How frequently do you use the intranet to access e-learning?
(u5)Knowledge map	How frequently do you use the intranet to access the knowledge map?
(u6)Search tools	How frequently do you use search tools available in the intranet?
(u7)Workflow	How frequently do you use the workflow resources available in the intranet?

The sense-making, knowledge creation, and decision-making constructs (Table 3) were based on the knowing organization model (Choo, 1998).

From March 2005 to May 2005, the questionnaire was applied to 98 Brazilian organizations and 70 Portuguese organizations. All the organizations belong to either The Brazilian KM Society or The Portuguese KM Society. Among the organizations, 17% were related to government, 14% to the information technology sector, 11% to the banking industry, 8% to the chemical and petroleum industry, 6% to the utilities sector, and the rest is distributed across 15 industries.

Among the respondents, 42% were from the IT department (Webmasters, intranet leaders, CIOs), 18% were from the HR (Human Resource) department, 11% had specific KM roles (CKOs or KM project leader), and the rest were from other departments (communications, research and development). All portal projects had more than 2 years of deployment, 85% of organizations had more than 100 employees, and 59% of the organizations had more than 500 employees.

Table 4 provides descriptive statistics (average and standard deviation – s) about portal quality:

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Table 3. Variables of the constructs related to the knowing organization model

Construct (Variable)	Question
Sense-Making(sm1)	The organization dedicates resources to detect and obtain external information from competitors, clients, universities, government, suppliers, and industrial associations.
Sense-Making(sm2)	The organization develops partnerships and alliances with other organizations in order to acquire and exchange information.
Sense-Making(sm3)	The organization creates opportunities to discuss changes in external environment.
Sense-Making(sm4)	The organization has a systematic approach to communicating its mission, values, shared meanings, and common beliefs.
Knowledge creation(kc1)	The organizational culture encourages experimentation, creativity, innovation, knowledge sharing and collaboration among departments.
Knowledge creation(kc2)	The organization facilitates collaborative work by project teams that are physically separated (“virtual teams”).
Knowledge creation(kc3)	The organization promotes the creation of communities of practice.
Knowledge creation(kc4)	The organization encourages experienced workers to transfer their knowledge to new or less experienced workers.
Knowledge creation(kc5)	The organization has formal mentoring and/or apprenticeships programs.
Knowledge creation(kc6)	The organization documents its projects and makes this information easily accessible.
Knowledge creation(kc7)	The organization maintains an organized and up-to-date information repository of good work practices and lessons learned.
Decision-making(dm1)	Information about good work practices, failures and/or errors, project documentation and lessons learned is taken into account when decisions are made.
Decision-making(dm2)	The organization has established decision routines and rules to support budget planning, project analysis, allocation of resources and project preordination.
Decision-making(dm3)	The organization extensively collects information to generate multiple options and alternative solutions to its problems.
Decision-making(dm4)	The organization stimulates collaborative decision-making, allowing individuals and groups to express openly their opinions.

Table 4. Average of quality variables

Variable	Avg	s
(q1)Quality of information	6.0	2.7
(q2)Locatability	5.9	2.5
(q3)Meaning of information	5.9	2.4
(q4)Compatibility	4.7	3.0
(q5)Productivity increase	6.6	2.9
(q6)Job facilitator	7.0	2.8
(q7)Job quality gain	6.8	2.8
(q8)Usefulness	6.9	2.7
(q9)Ease of training	6.7	2.7
(q10)Ease of use	6.9	2.6

Within the scope of this survey, portals were considered as *useful*(q8) and *ease to use*(q10) tools, but the *compatibility* issue(q4) was poorly evaluated, showing that the integration level is superficial. Portals work as a launch pad to many applications, but not always those systems share the same interpretations of data or agree upon a common terminology. Table 5 provides descriptive statistics about portal usage.

There was a concentration of answers in the middle of the scale, indicating a diary usage of the intranet from one half to one hour. This level of usage reinforces the perception of portal not as a critical and essential system, but as a support system confirming previous studies of Breu, Ward, and Murray (2000). In some features, such as *e-learning*(u4), *knowledge maps*(u5) and *workflow*(u7), a great percent of missing values were given, resulting in the exclusion of these variables in the further steps of the research. On the other hand, *access to non-structured information sources*(u2) and *collaboration*(u3) appeared as the most popular features of portals, maybe because other features were not available in

Table 5. Average of usage variables

Variable	Avg	N/A	s
(u0)General usage	5.7	0%	2.1
(u1)Structured information sources	5.6	23%	2.9
(u2)Non-structured information sources	6.3	3%	2.7
(u3)Collaboration	6.4	20%	2.8
(u4)e-learning	4.5	33%	3.1
(u5)Knowledge map	4.1	40%	3.0
(u6)Search tools	5.6	20%	3.0
(u7)Workflow	4.9	31%	3.0

Note: The column N/A means that the feature was not available in the portal.

Table 6. Average of knowledge dimensions variables

Variables	Avg	s	Variables	Avg	s
Sense-making(sm1)	5.5	3.1	Knowledge creation(kc1)	5.8	3.0
Sense-making(sm2)	6.1	3.0	Knowledge creation(kc2)	6.0	2.9
Sense-making(sm3)	5.7	2.9	Knowledge creation(kc3)	4.7	3.2
Sense-making(sm4)	6.8	2.9	Knowledge creation(kc4)	5.7	3.1
Decision-making(dm1)	5.0	3.0	Knowledge creation(kc5)	5.0	3.3
Decision-making(dm2)	5.7	3.1	Knowledge creation(kc6)	5.6	2.8
Decision-making(dm3)	5.4	3.0	Knowledge creation(kc7)	4.9	3.0
Decision-making(dm4)	5.8	2.9			

a larger scale. Table 6 provides descriptive statistics about knowing organization dimensions.

Among the knowing organization dimensions, sense-making presented better results than knowledge creation and decision making. This result may be partially explained by the increasing competitive environment that requires organizations to develop their abilities to interpret changing scenarios. Moreover, sense-making is more procedural than knowledge creation and decision-making, as it provides more conditions to a systematic approach through competitive intelligence and environmental scanning activities. Reliability analysis revealed adequate index for all of the constructs and none of the variables were deleted, as shown in Table 7.

Convergent and discriminant analysis were conducted in order to check that the constructs really measure different aspects of the problem. This procedure is required before conducting path analysis. Using AMOS 4 (structural equation modeling software), the path coefficients were

calculated for the research model resulting in the values shown in Table 8.

It is interesting to verify significant relationships among the dimensions of the knowing organization model (Choo, 1998). Sense-making has an influence on knowledge creation which is a dimension that impacts decision-making. Last but not least, decision-making affects sense-making completing the triad. Among these relationships in the existing data, the strongest one was from knowledge creation to decision-making. The quantitative analysis indicated that sense-making, knowledge creation and decision-making are interconnected processes in the organizations that participated in the survey.

The path analysis revealed that portal quality had a significant influence on sense-making and knowledge creation, but not on decision-making. On the other hand, portal usage had a significant impact on decision-making, but not on sense-making and knowledge creation. In a general way, sense-making

Table 7. Reliability analysis

Construct	Variables	Inter-Item Correlation	Cronbach's Alpha
Portal quality	q1	0.7795	0.9489
	q2	0.7579	
	q3	0.7738	
	q4	0.6724	
	q5	0.8335	
	q6	0.8579	
	q7	0.8530	
	q8	0.8474	
	q9	0.8006	
	q0	0.6694	
Portal usage	u0	0.4580	0.7013
	u1	0.4361	
	u2	0.4644	
	u3	0.4536	
	u6	0.4810	
Sense-making	sm1	0.7596	0.8753
	sm2	0.7728	
	sm3	0.7937	
	sm4	0.6080	
Knowledge creation	kc1	0.8252	0.9283
	kc2	0.8119	
	kc3	0.7263	
	kc4	0.7983	
	kc5	0.6649	
	kc6	0.7667	
	kc7	0.8305	
Decision-making	dm1	0.7769	0.9117
	dm2	0.7895	
	dm3	0.8546	
	dm4	0.7765	

and knowledge creation activities usually require a larger amount of time than what is available for decision-making. From this perspective, it makes sense that the effective usage of portals is more closely related to decision-making as it is the more action-oriented dimension of the knowing organization model. Figure 2 presents a new version of the research model describing only the significant relationships that were found in the analyzed data. This model obtained the following fit indexes: 0.931 (GFI – goodness of fit index), 0.936 (CFI – comparative fit index), 0.949 (NFI – normed fit index), 0.932 (NNFI—non-normed fit index).

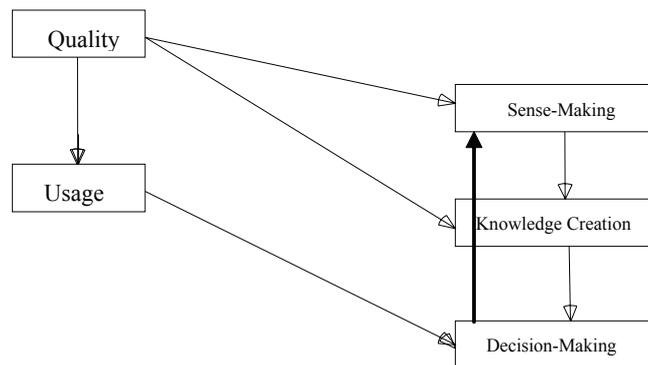
## FUTURE TRENDS

Overall, the results demonstrate that the evolutionary path from intranets to portals is not as easy and fast as it may seem. Some advanced features of portals such as workflow, e-learning and knowledge maps were not available in a significant amount of the organizations covered in this survey. Concerning future trends, the greatest challenge seems to be the deployment at a large scale of more advanced features instead of developing state-of-the-art features.

Table 8. Path coefficients derived from path analysis (Source: AMOS 4)

Constructs		Regression	Std. Error	t-value	p
Independents	Dependents				
<b>Portal Quality***</b>	Sense-Making (0,484)	<b>0,23</b>	<b>0,08</b>	<b>2,84</b>	<b>0,00</b>
Portal Usage		0,13	0,08	1,67	0,10
<b>Decision-Making***</b>	Knowledge Creation (0,642)	<b>0,36</b>	<b>0,09</b>	<b>4,02</b>	<b>0,00</b>
<b>Portal Quality***</b>		<b>0,40</b>	<b>0,07</b>	<b>6,14</b>	<b>0,00</b>
Portal Usage		0,10	0,06	1,67	0,10
<b>Sense-Making ***</b>	Decision-Making (0,665)	<b>0,39</b>	<b>0,07</b>	<b>5,87</b>	<b>0,00</b>
Portal Quality		0,09	0,07	1,27	0,20
<b>Portal Usage**</b>		<b>0,15</b>	<b>0,06</b>	<b>2,60</b>	<b>0,01</b>
<b>Knowledge Creation***</b>	Portal Usage (0,401)	<b>0,62</b>	<b>0,07</b>	<b>9,26</b>	<b>0,00</b>
<b>Portal Quality***</b>		<b>0,63</b>	<b>0,06</b>	<b>10,58</b>	<b>0,00</b>

Figure 2. Final version of the research model



Moreover, future work needs to be done in order to solve compatibility issues. Many applications are being integrated to the portal environment with no previous planning. Real integration requires investments on better interfaces among systems, common taxonomies and infrastructure. The synergy between portal and EAI (Enterprise Application Integration) agendas seems to be a straightforward approach for this issue.

## CONCLUSION

The research model intends to be a proposal for a common framework to evaluate the effects of portal usage on KM projects. As portals are being implemented as the major

technological infrastructure of KM projects, organizations need instruments to evaluate whether the expected effects are being achieved or not.

Nevertheless, the model still has some limitations. Due to the size of the sample and to the cultural aspects of KM, it is not possible to generalize the results to other countries. On the other hand, it is important to report that many of the respondents have found the model quite useful as a diagnosis mechanism for their portals. Some respondents have commented that the questionnaire has helped them in identifying strengths and weakness of their portals and KM initiatives.

The research model combines studies from information science and information systems literature, adapting them to the portal's context. In addition, it tries to establish a link

between technological and management perspectives in order to increase the benefits of using portals to support KM processes. Finally, the survey results indicate that the knowing organization model (Choo, 1998) provides a consistent framework in investigating the KM phenomenon.

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## KEY TERMS

**Groupware:** Type of software that is designed to help teams that are geographically dispersed and need to work together.

**Knowing Organization:** Framework designed by Choo (1998) that describes organizations as systems where the processes of sense-making, knowledge creating and decision-making are continuously interacting.

**Knowledge Maps:** Also known as expertise locators and yellow pages, they contain a “who knows what” list, pointing to people and creating opportunities for knowledge exchange.

**Sense-Making:** Process related to how the organization interprets and makes sense of its changing environment which leads to shared meanings and intent.

**Task Technology Fit (TTF):** Model developed by Goodhue and Thompson (1995) that analyses the linkage between information system usage and individual performance.

**Technology Acceptance Model (TAM):** Model developed by Davis (1989) to explain and predict computer usage behavior.

**Workflow:** Systems that support standardised business processes, regulating the information flow from person to person, place to place, task to task, in processes that require ordered and structured information.