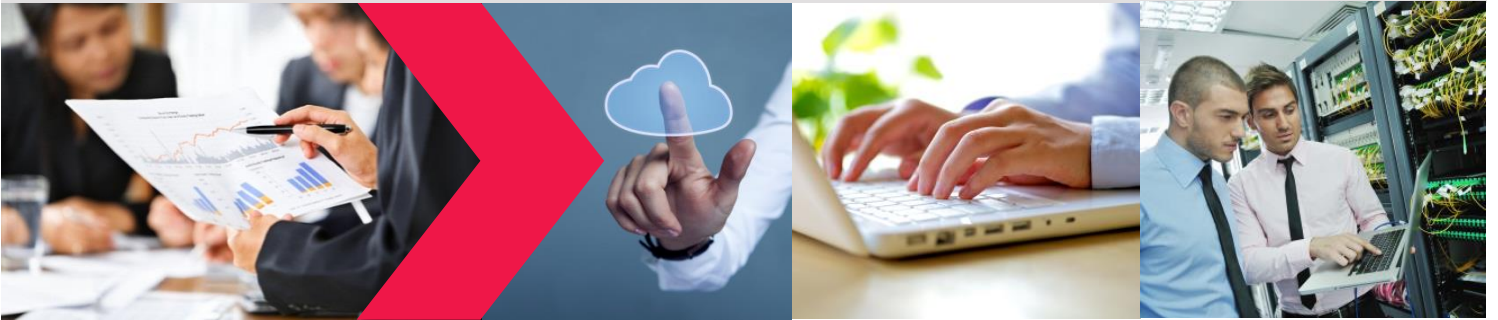


Evaluation Tools for Adoption of Cloud Hosting Services



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Take Home Message

- Knowledge Impact Strategies found no existing full-service tools for evaluating adoption factors for cloud computing hosting services
- Most tools are centered around the costs of adopting cloud hosting services
- Tools that focus on calculating costs vary from one another in:
 - What they calculate (e.g., hardware costs, operational costs)
 - What factors they involve (e.g., storage space, number of servers)
 - The time period they comprise (e.g., quarterly, yearly)
- Tools focusing on Infrastructure as a Service (IaaS) assume that customers:
 - Have detailed knowledge of their IT requirements
 - Understand how needs translate into cloud services
- Only two tools, both assessing costs, directly weighed the differences amongst cloud computing services:
 - One compared private hosting versus in-house cloud computing facilities
 - The other compared public hosting versus in-house cloud computing facilities

Overview

Knowledge Impact Strategies was asked by an IT consulting firm to determine whether tools are available to help organizations determine the best source of cloud hosting services for their individual corporate needs.

We found 29 tools using two resources.

- We scanned the Internet for online tools using DEVONagent. Four queries ran for 6 hours. Sixteen online tools were found using this method.
- We searched for recent (2011-2013) peer-reviewed research articles using the Scopus and Engineering Village databases. In total we found and examined 175 articles. Of those, 104 were not applicable to the topic. One article was not available for review. Of the remaining 70 articles, 57 provided coherent arguments, concepts, and consideration of the need for cloud services decision-making resources. Only 13 research articles described actual tools.

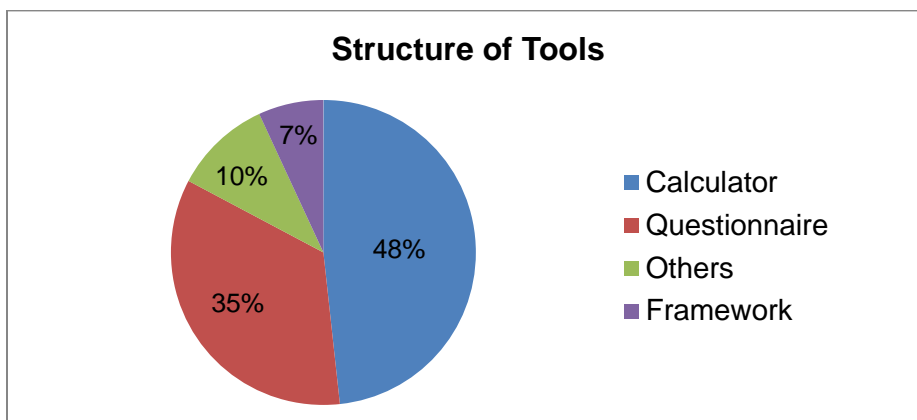
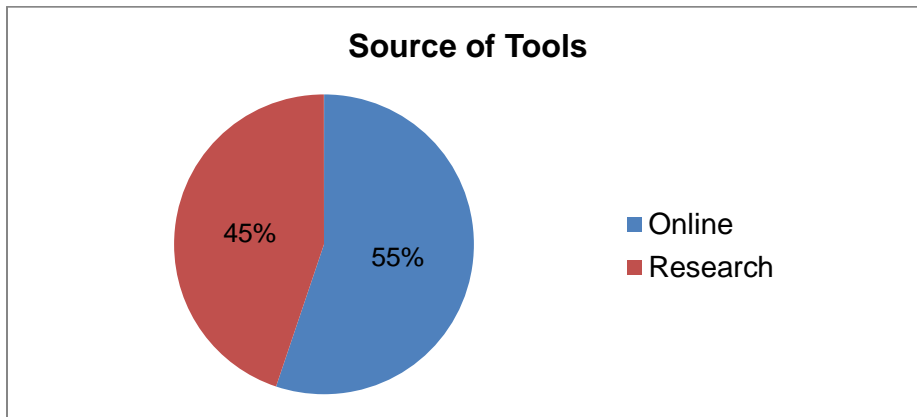


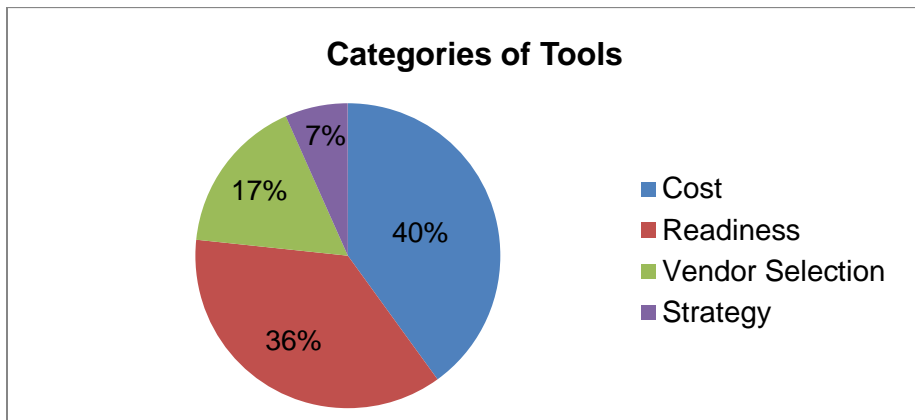
Each tool was examined and its features were catalogued in a spreadsheet. Features included:

- **Category** (type of assessment(s) that the tool provides)
- **Source** (tool provider or article citation)
- **Structure** (such as calculator, questionnaire)
- **Purpose** (overall intention for creating the tool)
- **How** (method of using the tool)
- **Output** (what the tool provides to the user)

Highlights of the resources are presented below. The highlights indicate the current state-of-the-art overview in tool development that serves decision-making in the adoption of cloud computing services. The characteristics of each tool can be examined in further detail in the spreadsheet.

Landscapes of Resources





Highlights of Results

Tools from Online Sources:

- All of the tools found online are free. Some tools require users to register an account in order to access them
- Tools can be found on cloud vendors or consulting company websites
- From the tools found online, tools most frequently address cost assessment
- Tools provide results that are typically only guidelines or general observations
- Users of tools have the option of booking appointments to:
 - Explore tool results in more detail
 - Design a strategy
 - This feature does not apply to tools found in research articles

Tools from Research Sources:

- Research suggests that Small and Medium Enterprises (SMEs) are the main market for cloud computing services
- Research studies primarily address cost assessments and savings
- One researcher has proposed to develop a multi-dimensional assessment for cloud migration (Hosseini et al., 2011 and Hosseini et al., 2012)

Tools Overview:

- Tools come in a variety of forms, such as online tools, spreadsheets, documents, and even applications
- There were no full-service tools for evaluating cloud-computing migrations. Full service would include: cost, energy consumption, corporate user impact, technology, and corporate responsibility
- Instead, existing tools evaluate:
 - **Cost:** including hardware, software and operational costs
 - **Readiness:** to adopt a cloud computing system
 - **Vendor Selection:** the match between the vendor's services and user's profile and needs
 - **Strategy:** cloud feature options based on user priorities

Tools from Online Sources					
Category	Source	Structure	Purpose	How	Output
Cost	2nd Watch (http://tco.2ndwatch.com)	Calculator	To compare Amazon Web services cost using a 7-point criteria.	Users indicate deployment needs online using sliders.	Categorized cost report
Cost	Cloud Service Market (http://www.cloudservicemarket.info/tools/tco.aspx)	Questionnaire	To support decision making in order to understand the costs associated with cloud. Provides costs organized by type and includes examples of cost factors.	Users complete an online multiple choice questionnaire regarding cost factors, also providing total costs for each.	Online report
Cost	Clouorado (http://www.clouorado.com)	Calculator	To calculate cloud server prices and make custom IaaS cloud computing provider cost comparisons. Provides an advanced mode with a deeper level of detail to support the decision making process.	Users indicate deployment needs online using sliders.	Online cost report per vendor
Cost	Evolve IP (http://pages.evolveip.net/virtualization-tco-calculator.html)	Calculator	To determine hardware, software and operational costs.	Users input cost information into an Excel spreadsheet.	Excel results
Cost	Gocipher Web Services (http://cloudpricecalculator.com)	Calculator	To calculate an index called Cloud Price Normalization (CPN) based on some parameters. Index can be compared with a list of IaaS vendors.	Users complete an online form requiring information on cloud parameters.	Index
Cost	Meri Talk (http://www.meritalk.com/savings-calculator-register.php)	Calculator	To explore cost savings through a six category analysis using industry and government metrics.	Users input current IT environment information.	Cost results using tables and graphs
Cost	Right Scale (http://www.planforcloud.com)	Calculator	To forecast the customer's cloud deployment strategy, define usage scenarios, and update forecast when prices change using Amazon, Azure, Rackspace and Google.	Users complete an online form.	Graphic analysis of deployment
Cost	Solar Winds (http://www.solarwinds.com/products/freetools/vm-to-cloud-calculator.aspx)	Calculator	To compare cost estimates of moving virtual machines to the cloud using public cloud providers (Amazon, Azure, Rackspace). Can also report costs per hour, month, quarter or year.	Users run software to assess existing virtual machines.	Cost report

Category	Source	Structure	Purpose	How	Output
Readiness	Info ~ Tech Research Group (http://www.infotech.com/research/ss/it-develop-a-cloud-testing-strategy-for-todays-apps/it-cloud-testing-readiness-assessment-tool)	Questionnaire	To evaluate readiness considering people, process and technology silos. Provides recommendations on areas of improvement.	Users complete questionnaire.	Online report and scenarios
Readiness	Microsoft (http://www.cloudassessmenttool.com)	Questionnaire	To evaluate priorities and barriers, existing infrastructure, and processes. Provides recommendations based on the answers.	Users complete an online questionnaire using sliders.	Online report and PDF
Readiness	Rackspace (http://www.rackspace.com/cloud/self_assessment/)	Questionnaire	To analyze business and technology factors such as strategy, infrastructure, and technical requirements to determine the readiness level for migrating services to the cloud.	Users complete questionnaire.	Evaluation (low to high) per dimension
Readiness	The Armanda Group (http://www.assessmentgenerator2.com/sys/?module=assessment&assessment_id=686)	Questionnaire	To evaluate whether or not companies are effectively planning for using cloud computing.	Users complete an online multiple choice questionnaire.	Score and position on readiness scale
Readiness/ Vendor selection	Bell (http://www.bell.ca/enterprise/portlets/enterprise/documentform/core_content_downloads.jsp?FormId=ReadinessCloud&language=en)	Questionnaire	To provide insights on whether or not a business model is prepared for cloud, what requirements are needed before migrating, and how to find if the cloud offering matches the business' needs.	Users complete a non-interactive questionnaire.	None
Strategy	Accenture (http://www.accenture.com/Microsoft/cloudstrategy/Pages/home.aspx#/screen-0)	Questionnaire	To assess four dimensions (strategy, applications, platforms, infrastructure) and provides a score and feedback for each dimension.	Users complete an online questionnaire.	Online assessment report
Strategy	The Cloud Calculator (http://www.thecloudcalculator.com/calculators/cloud-build-vs-buy.html)	Calculator	To compare the cost of hosting with public vendors or deploying on the internal network cloud services.	Users indicate deployment needs online using sliders.	Online and PDF cost comparison
Vendor selection	ACCA (https://accacat.herokuapp.com)	Questionnaire	To evaluate critical capabilities required to migrate applications to the cloud.	Users indicate deployment needs.	Online report

Tools from Research Sources					
Category	Source	Structure	Purpose	How	Output
Cost	Khajeh-Hosseini, A., Greenwood, D., Smith, J. W., & Sommerville, I. (2012). The cloud adoption toolkit: Supporting cloud adoption decisions in the enterprise. <i>Software - Practice and Experience</i> , 42 (4), 447-465.	Calculator	To help decision makers consider whether and which forms of cloud computing would operate best for their organization. Provides an estimate of the operational costs of adopting a cloud system.	Users input their cloud services requirements in a software application.	Cost analysis based on technology suitability, energy consumption, stakeholder impact, responsibility, and cost.
Cost	Lilienthal, M. (2013). A decision support model for cloud bursting. <i>Business and Information Systems Engineering</i> , 5(2), 71-81.	Calculator	To support user decision-making by calculating the optimal amount of internal cloud computing resources and expected cost reductions of strategic public cloud deployment.	Users input a performance dataset, such as the types of costs and resources involved in the CPU usage.	Analysis of cost savings and optimal size of internal capacity for deploying cloud bursting.
Cost	Perez-Palacin, D., Calinescu, R., & Merseguer, J. (2013). Log2cloud: Log-based prediction of cost-performance trade-offs for cloud deployments. 397-404.	Calculator	To predict the costs for a cloud deployment of an application. Provides expected trade-offs between cost and performance.	Users provide existing application logs. These logs report the number of requests handled by the application.	Table reporting VM costs for cloud deployment.
Cost	Tran, V. T. K., Lee, K., Fekete, A., Liu, A., & Keung, J. (2011). Size estimation of cloud migration projects with cloud migration point (CMP). 265-274.	Cloud Migration Point methodology	To estimate the size of a cloud migration project (keeping the existing application software, but running it on a cloud platform).	Users input the necessary information into the CMP model such as network connections, complexity of tasks per connection, and a weighted value per connection.	Project size estimation.
Cost/ Readiness	Khajeh-Hosseini, A., Sommerville, I., Bogaerts, J., & Teregowda, P. (2011). Decision support tools for cloud migration in the enterprise. 541-548.	Calculator, risk/benefit analysis	To support decision-making during the adoption of cloud computing systems. Provides a report that shows the cost of the system over time and gives users an increased understanding of the benefits and risks of cloud as applied to the user's company.	Users input their current IT infrastructure information and consider the risks and benefits of using cloud.	Cost analysis breakdown considering three scenarios: buying, leasing, or using elasticity of the cloud.
Readiness	Bayrak, T. (2013). A decision framework for SME information technology (IT) managers: Factors for evaluating whether to outsource internal applications to application service providers. <i>Technology in Society</i> , 35(1), 14-21.	Framework	To provide users with a framework on how to make decisions with regards to adopting a cloud computing system. Provides a clearer overview of the benefits and concerns associated with cloud computing, leading to better decision-making.	Users consider the favorable and unfavorable factors relating to cloud adoption.	None.

Category	Source	Structure	Purpose	How	Output
Readiness	Christoforou, A., & Andreou, A. S. (2013). A Cloud Adoption Decision Support Model Based on Fuzzy Cognitive Maps. <i>Product-Focused Software Process Improvement</i> , 7983, 240-252.	Certainty Neuron Fuzzy Cognitive Maps (CNFCM) methodology	To support users in the cloud adoption decision-making process by modeling a number of parameters such as cost/pricing which may influence the decision.	Users input the necessary information into the CNFCM model by ranking each parameter on a scale of 'negatively very high' to 'positively very high.'	A numerical value which suggests a positive or negative adoption decision based on the input values for each parameter.
Readiness	Gash, D., Ariyachandra, T., & Frolick, M. (2012). Looking to the clouds for business intelligence. <i>Journal of Internet Commerce</i> , 10(4), 261-9.	Framework	To guide users through the process of implementing a cloud system. Provides users with an increased understanding of how the move to cloud computing can ideally be implemented in the user's individual situation.	Users consider a number of questions and factors which will affect their ideal cloud implementation.	None.
Readiness	Misra, S. C., & Mondal, A. (2011). Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding return on investment. <i>Mathematical and Computer Modelling</i> , 53(3-4), 504-521.	Calculator	To help companies determine their favourability in adopting a cloud computing system. Provides a numerical value that measures whether a company is suitable for the adoption of a cloud system.	Users fill out a tabulation sheet and calculate a score based on the given formula. Users also calculate the company's return on investment.	Suitability index that indicates whether or not a company should adopt cloud computing services and save money.
Readiness	Tan, C., Liu, K., & Sun, L. (2013). A design of evaluation method for SaaS in cloud computing. <i>Journal of Industrial Engineering and Management</i> , 6(1), 50-72.	Questionnaire	To assess an organization's readiness to adopt a cloud computing system. Provides a summary that provides a recommendation of whether an organization should adopt a cloud computing system based on level of readiness and cost comparison.	Users answer questions and consider a variety of factors that will affect their existing IT landscape.	Evaluation report of SaaS adoption including a general assessment, risk assessment, and cost.
Vendor selection	Menzel, M., Schönherr, M., & Tai, S.(MC2)2: Criteria, requirements and a software prototype for cloud infrastructure decisions. <i>Software - Practice and Experience</i> ,	Questionnaire	To help potential users determine which cloud infrastructure best suits their needs. Provides a recommendation regarding a specific cloud computing provider.	Users enter information regarding the components of their IT environment, their computing needs, and their preferences regarding factors such cost and quality.	Cost calculation based on a list of proposed categories.
Vendor selection	Rehman, Z. U., Hussain, F. K., & Hussain, O. K. (2011). Towards multi-criteria cloud service selection. 44-48.	Algorithm	To help users determine which cloud service vendors they should pick. Provides a numerical measure that indicates which cloud service vendor best matches the user's requirements.	The work presented in this study is under development, and takes only the form of a mathematical decision matrix.	Cloud service selection among different options that are similar in specification but different in performance.
Vendor Selection	Shawky, D. M., & Ali, A. F. (2012). Defining a measure of cloud computing elasticity.	Calculator	To provide users with an evaluation of a cloud computing system's performance. It provides a measurement of a cloud computing system's ability to expand and contract in response to users' demand.	By calculating the ratio of required resources and allocated resources.	Measure of elasticity in cloud computing (IaaS).

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