Decision Support Projects Survey

Project Success & Organizational Performance
September - December 2017

August 2018
Version 1.0

maxmetrics®

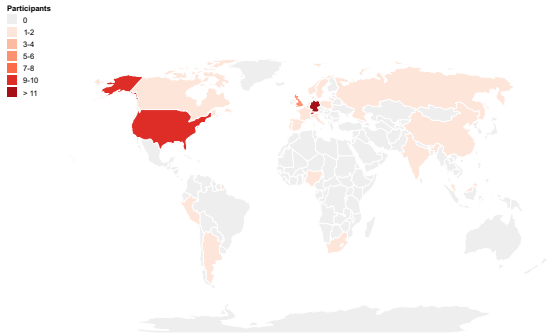
Survey Decision Support Projects
September - December 2017

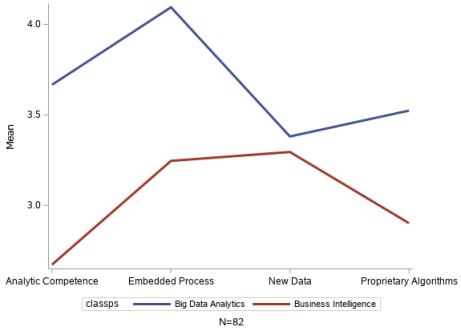
Introduction

The aim of the research was to understand the success criteria for decision support projects and what influences the performance of those projects. Decision support projects are implementation projects that deliver data, analytical models, analytical competence, or all three, for unstructured decision-making and problem-solving. They include subspecialties such as big data, advanced analytics, business intelligence, or artificial intelligence. This report summarizes the survey inputs from and analysis from 78 projects. The first section provides descriptive statistics for the data that was collected as part of the survey. The second section provides summary of the analysis that was performed with the survey data.

Executive Summary

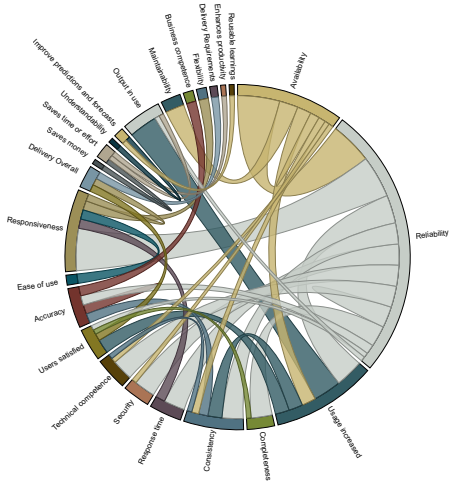
The majority of the projects were undertaken as internal projects by large organizations, with big teams and networks of involved organizations. They were diverse in terms of complexity, pace, novelty, and team structure. The participants were from 22 countries with 73% being based in Europe.

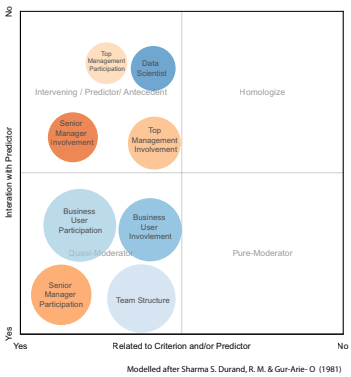




Analytic competency and building analytical models and algorithms are characteristics that differentiate the decision support project types.

System quality and information quality are critical success factors that influence system usage and system usage influences project success. Project schedule and budget performance are not correlated with the other success measures so they are not critical success factors in most cases.





Business user, senior manager, top management, and data scientist participation in project activities such as requirements and model building is a benefit. It increases the chances of achieving organizational benefits months or years after the project has been completed.

Bottom line:

The recommendation is to actively engage business users and senior managers in hands-on project work such as building models and to focus on providing sufficient system and information quality. As a consequent, the project should deliver long term organizational benefits.

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About the Survey

The web-based survey was used to collect the data over a ten-week period (September 2017 to December 2017) from a single informant. Project managers, team members, and sponsors from completed decisions support projects were requested to take the survey. The responses were checked for scope, completeness, consistency, ambiguity, missing data, extreme responses, outliers, and leverage. Validity checks for common method bias, response bias, and reliability were conducted. No bias was found, and the data were considered to be reliable and valid.

Three channels were used to distribute the survey: an email campaign, social media, and personal contacts of the researcher. Data conditioning was conducted to remove survey responses that were either not relevant, incomplete, or ambiguous. Data entry was mandatory for the organizational performance and system use variables. When there was missing data for these variables, it was presumed that the participant abandoned the survey and the entries were deleted. In summary, 142 people started the survey and 82 responses were usable.

Missing data was permitted in the remaining variables. For non-demographic data, missing data was considered a lack of knowledge by the respondent and the values were set to zero to indicate “Don’t know” or “Not Applicable.” In the demographic data, the respondents were requested to enter the country of their geographic location and that for the organizational entity under study. When the country of the corporate entity was missing, it was replaced with the country of the participant. Other missing data in the demographics were classified as ignorable missing data and not replaced. These are listed as missing in the descriptive statistics.

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1 Descriptive Statistics

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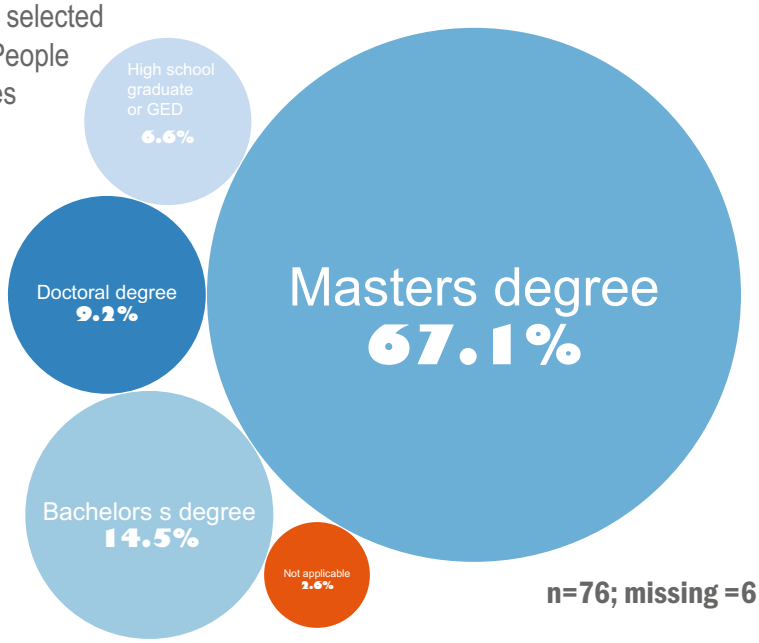
Respondent Demographics

The majority of the respondents have a Master's degree or higher, are Project or Program Managers, are located in the IT department, and are based in Europe. The respondents selected a single project for which they would provide answers. People from the IT department, consultants, or other third parties responded from the perspective of their client.

Education

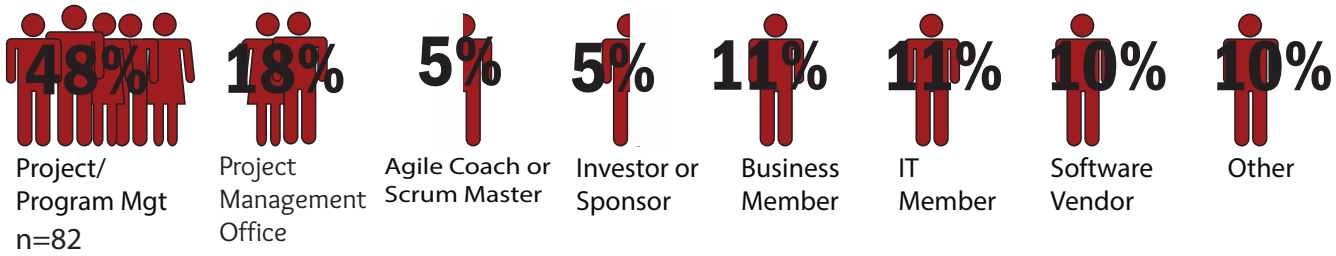


n=76; missing =6

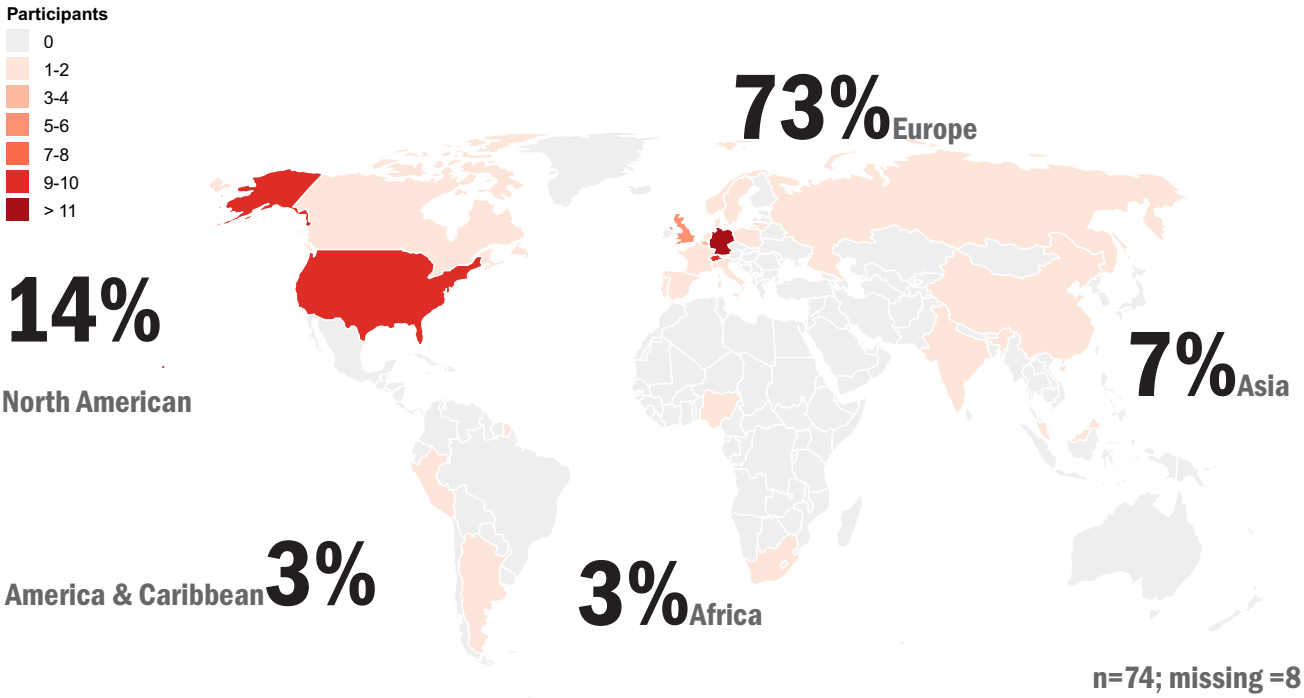
Functional Department

n=74; missing =8

Project Role



Geographic Location



n=74; missing =8

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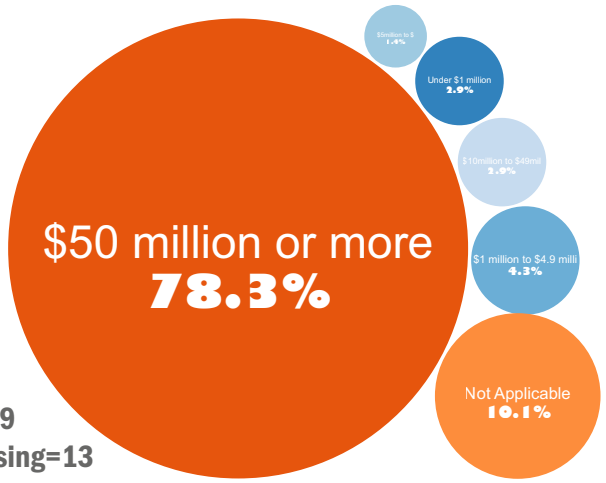
Organizational Demographics

The organizations sponsoring the project were mostly publicly traded and large, with more than 249 employees and 50 million USD revenue. They are spread through 22 countries with the majority being based in Europe. The geographic location of the organizations varies slightly from the participants, with more organizations than participants being based in North America.

Revenue Size



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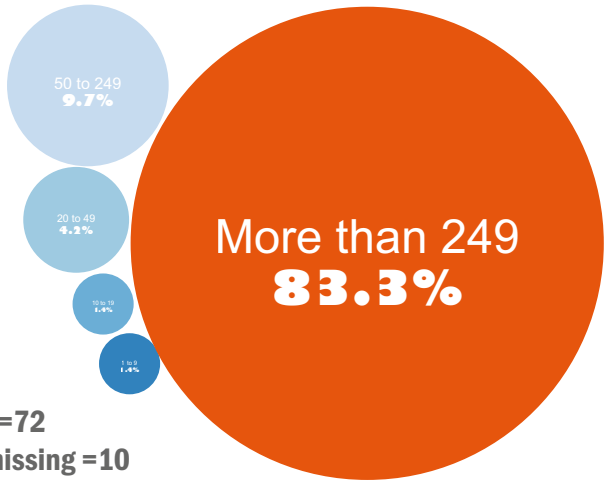
Number of Employees



n=72
missing =10

Types of Organizations

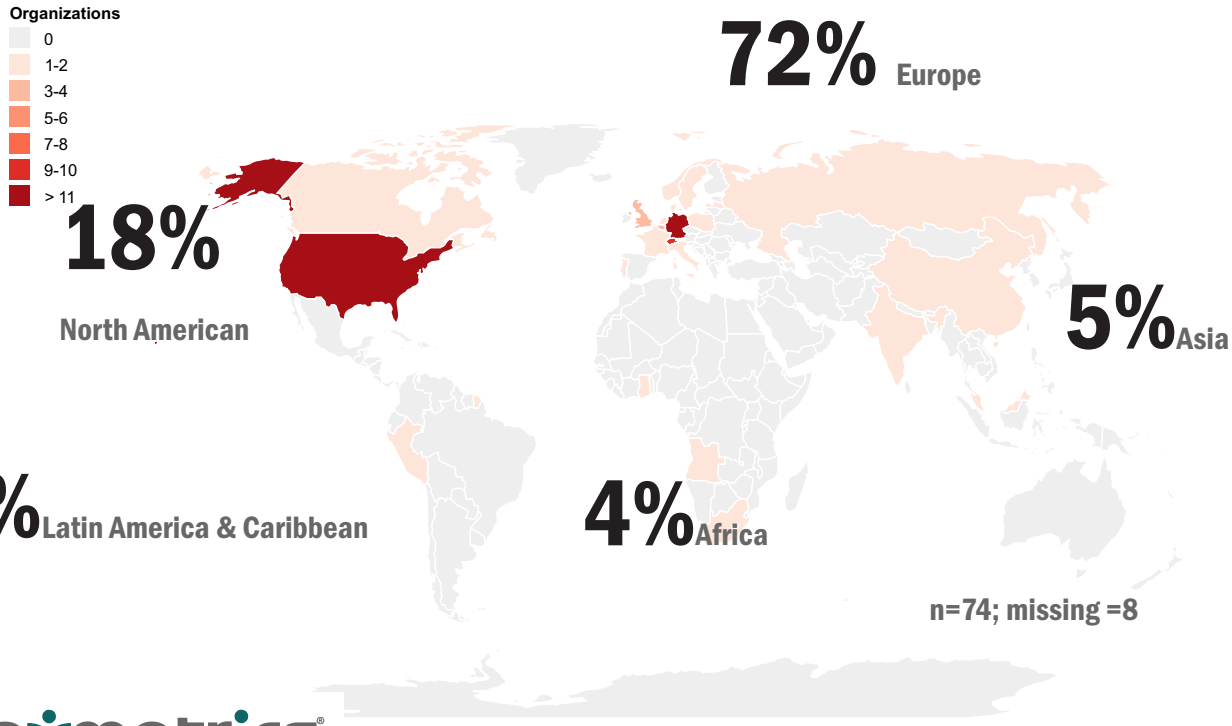
1.3%	51.3%	31.6%	5.3%	2.6%	3.9%	3.9%
Other	Publicly traded	Privately held	Non-profit	Educational institution	Government agency	Public-Private Partnership

6 - Missing values

n=76; missing =6

N=78

Geographic Location



n=74; missing =8

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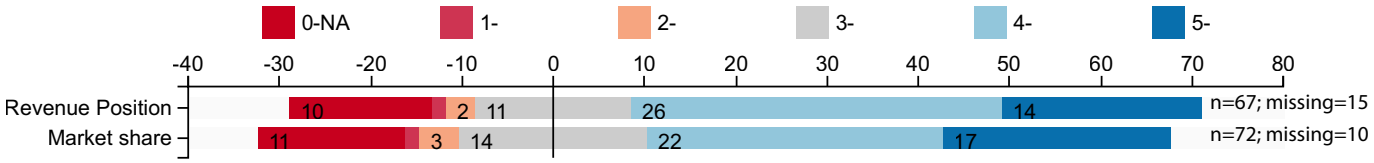
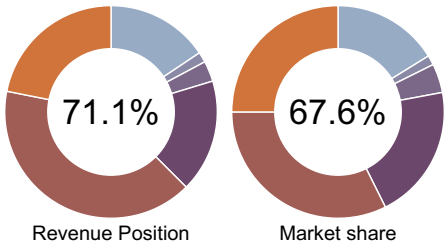
The organizations were spread through 22 different industries. The revenue and market percentage was not given or relevant for some respondents. Nevertheless, when provided close to 70% of the participants reported on a project from companies with a revenue position above and with a stronger market share than their competitors. The reference line is the boundary in the middle of the range from "1-Not at all" to "5-To a great extent."

Market Position Ratings



Percent of respondents that ranked their organization's position above competitors.



Industries

n=75; missing=7

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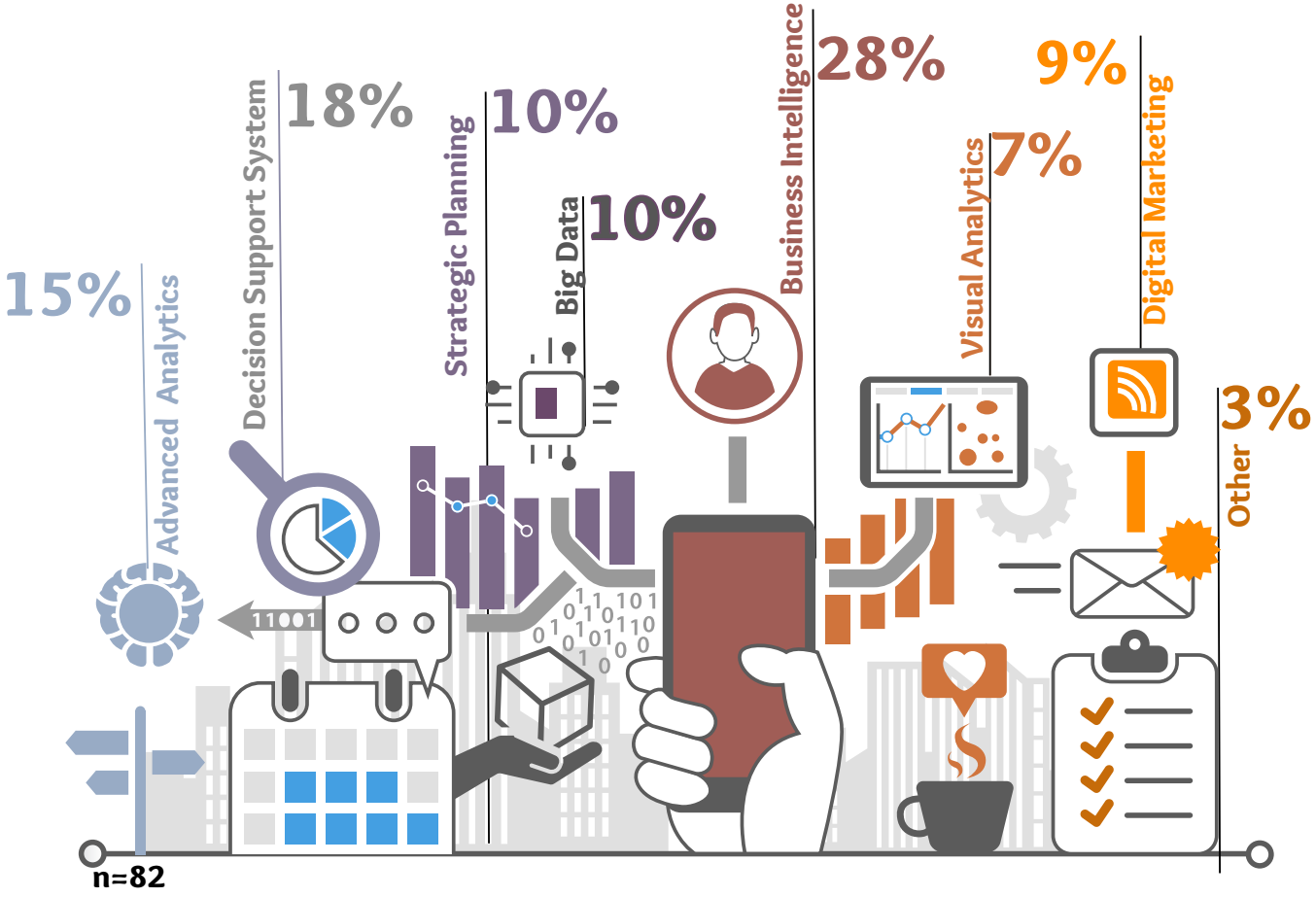
Project Scope

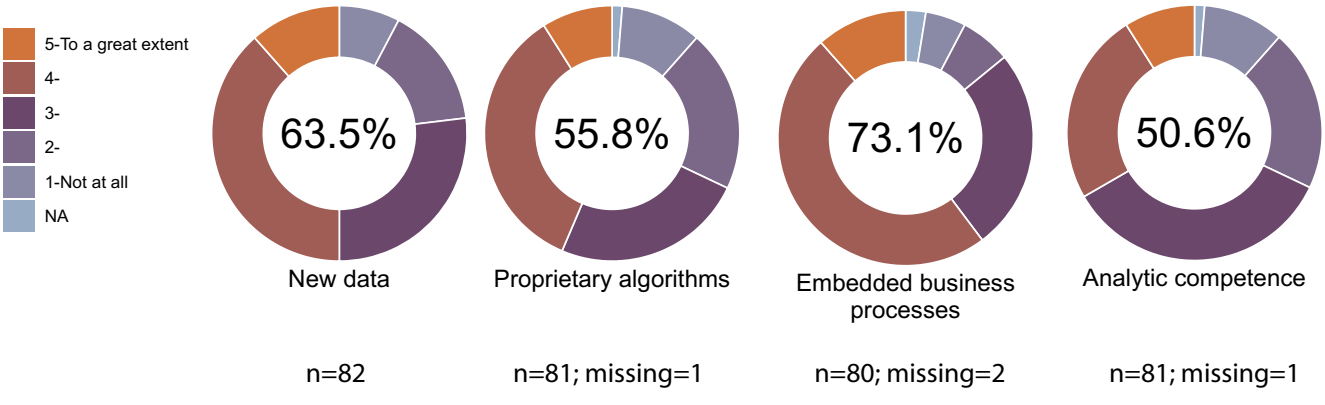
Decision Support Type

The following decision support subspecialties were included in the study based upon self-reporting from the respondents. Expert systems and Artificial Intelligence were in the other category.



Project Deliverables

More than half of projects delivered new data, algorithms or business models, analytic competence, and embedded the new capabilites into the business processes. The diagram indicates the percentage of projects that included the topic as a devilerable.



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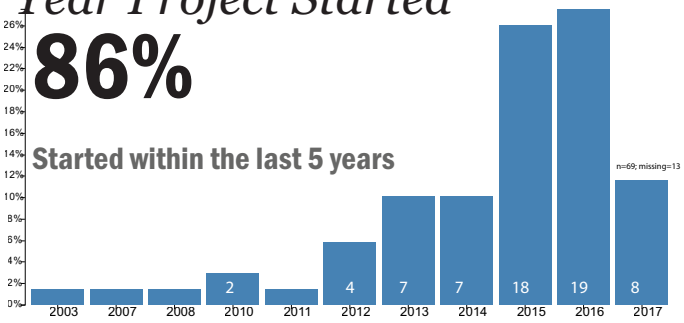
Project Attributes

Considering the project attributes, the majority of projects were conducted for internal users or another department, were started in the last 5 years, the costs were under 3 million USD, and the durations were 18 months on average, with half lasting more than one year. Half the projects had more than 10 team members, and the majority involved at least 3 organizations and 3 departments.

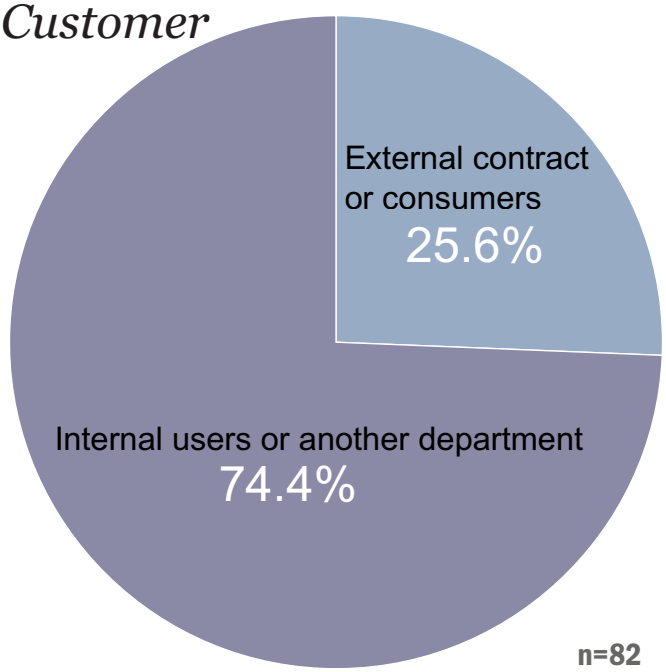
Year Project Started

86%

Started within the last 5 years



Customer

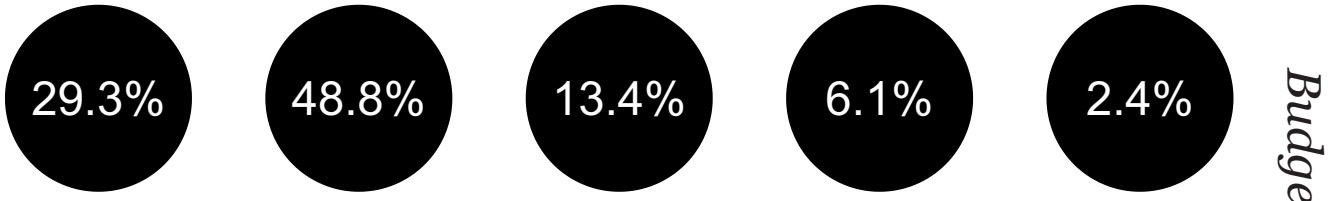


n=82

Duration

n=82

Budget



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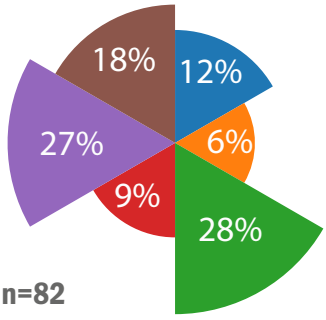
People Involved



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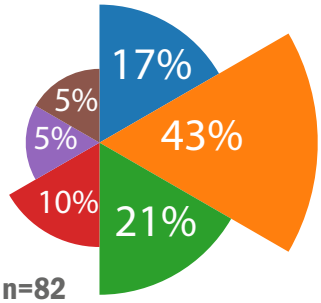
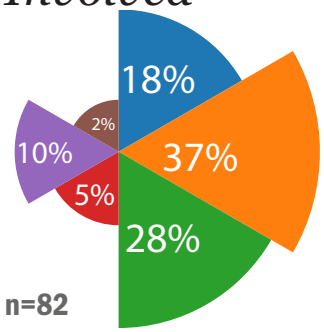
Departments Involved



n=82

Organizations Involved



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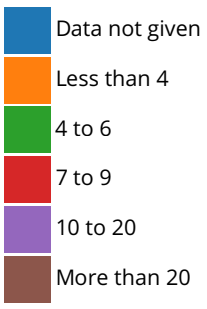

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Project Classification

The most common complexity involved multiple systems or functions. A fast pace was important in just under 50% of the cases, and 90% of the cases involved at least some technology that was either new, mostly new, or non-existent at the start of the project. The novelty of the project output was fairly equally distributed from improvements of existing product to introducting a totally new product. The average values are shown in the radar chart.

Complexity

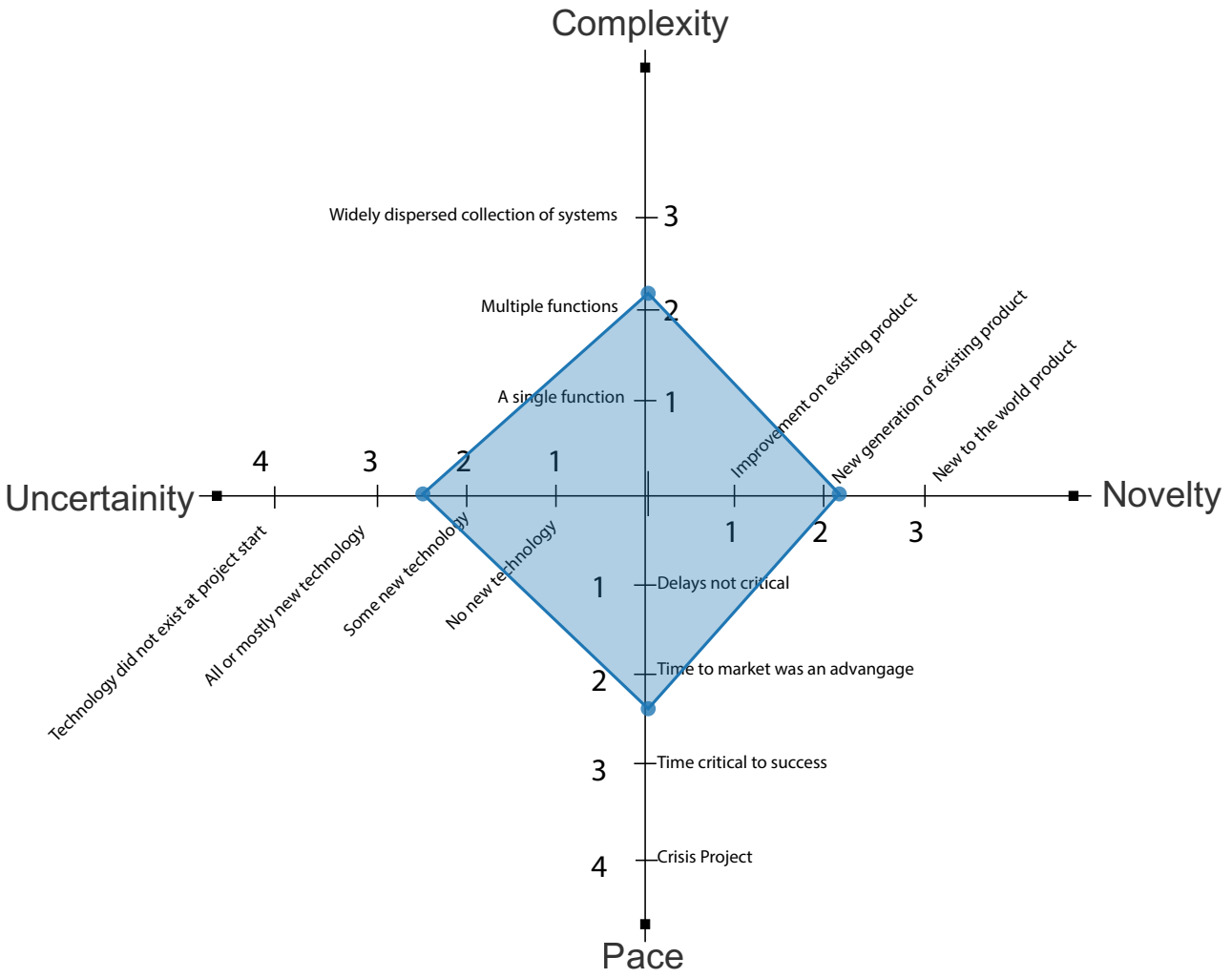
9.1%	66.2%	24.7%
A single system or function	Multiple systems or functions	A widely dispersed

n=77; missing=6

Novelty

31.6%	31.6%	36.8%
An improvement of an existing product	A new generation of an existing product line	A new-to-the-world product

n=76; missing=6



Uncertainty

10.5%	46.1%	34.2%	9.2%
No new technology	Some new technology	All or mostly new but some existing technologies	Technology that did not exist at the project initiation

n=76; missing=6

Pace

23.1%	28.2%	43.6%	5.1%
Delays were not critical	Time to market was an advantage	Completion time was critical to success (had to meet a specific time window)	Crisis project

n=78; missing=4

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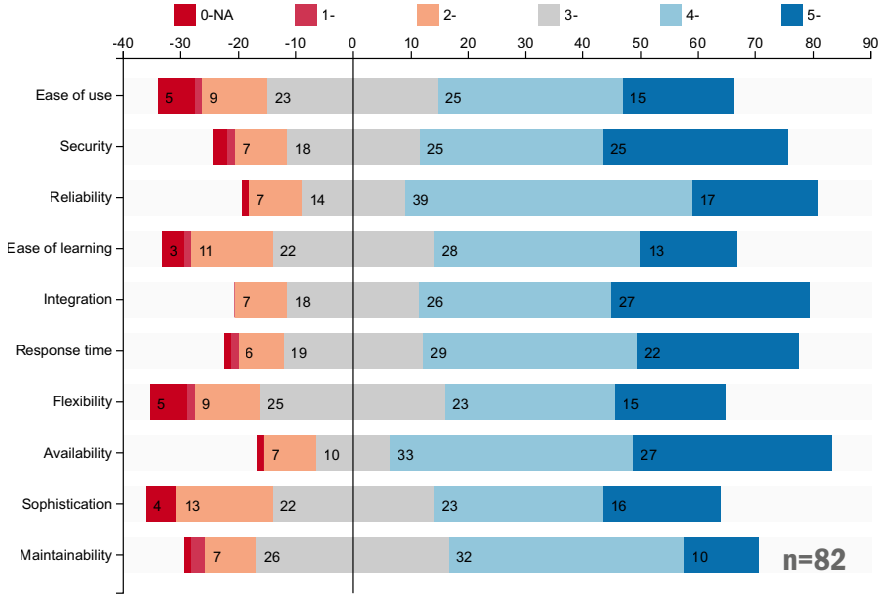
Project Quality Criteria

The project quality criteria indicates how well the project met the success criteria. Not all criteria were relevant to all projects so Not Applicable (NA) was a selection criteria. The values for NA are shown in the diagram, but excluded from the reference line. The reference line is the boundary in the middle of the range from "1-Not at all" to "5-To a great extent."

System Quality

System quality measures the system itself, with a focus on the engineering-oriented performance characteristics.

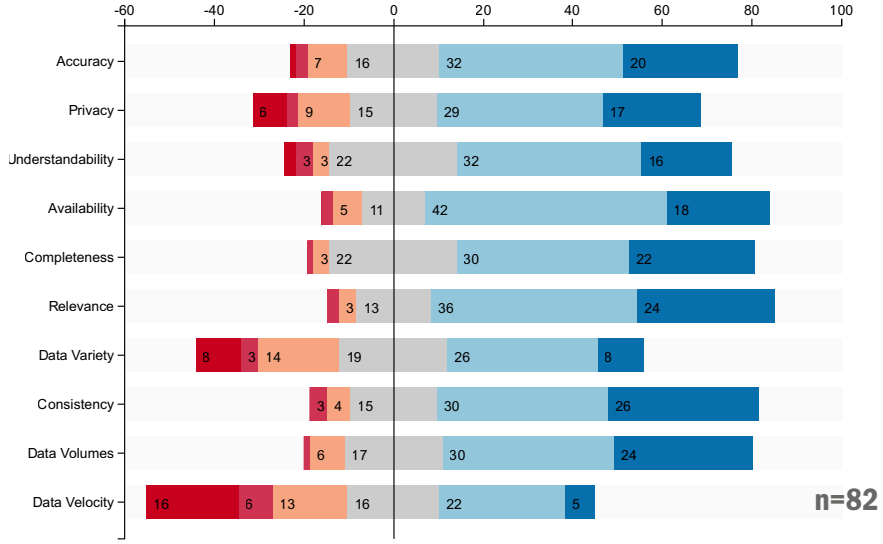
A composite variable Overall System Quality was created for further analysis. It excluded response time and availability to maintain statistical reliability.



Information Quality

Information quality measures the quality of the output of the system: the information or results that are consumed by the users.

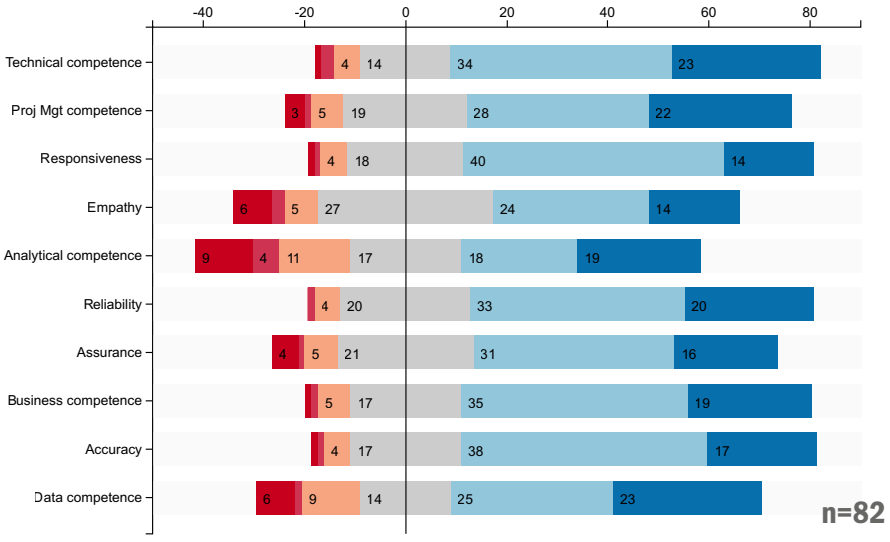
A composite variable Overall Information Quality was created for further analysis. It excluded consistency and data velocity to maintain statistical reliability.



Service Quality

Service quality measures the project teams personal qualities and competencies. Competencies specific to the decision support domain were included.

The composite variable Overall Service Quality excluded Project Management competency to maintain statistical reliability.



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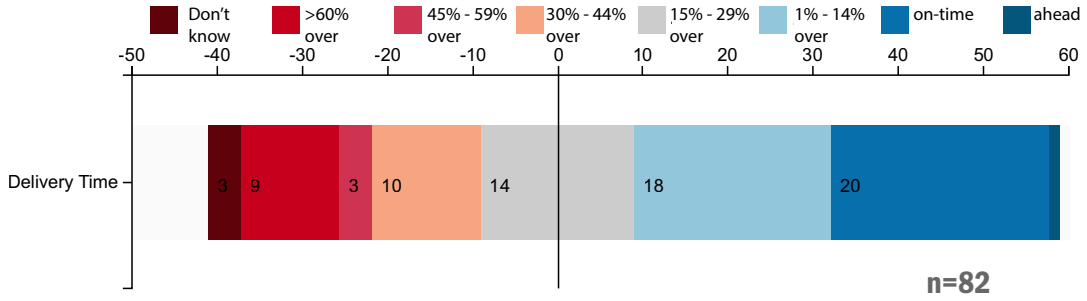
Project Efficiency

Project efficiency, also known as project management success, evaluates performance against the time, budget, and quality constraints of the project. Project efficiency is one contributor to project success. “Don’t know” was included as an data entry option to avoid spurious data. “Dont’ know” and NA are shown in the diagram, but excluded from the reference line. Many projects (58.54%) were successful or very successful overall, but did not meet or exceed the time and budget requirements. Conversely, few projects (6.10%) were successful or very successful that did not meet or exceed the scope or requirements.

Meeting Time Goals

61.3%

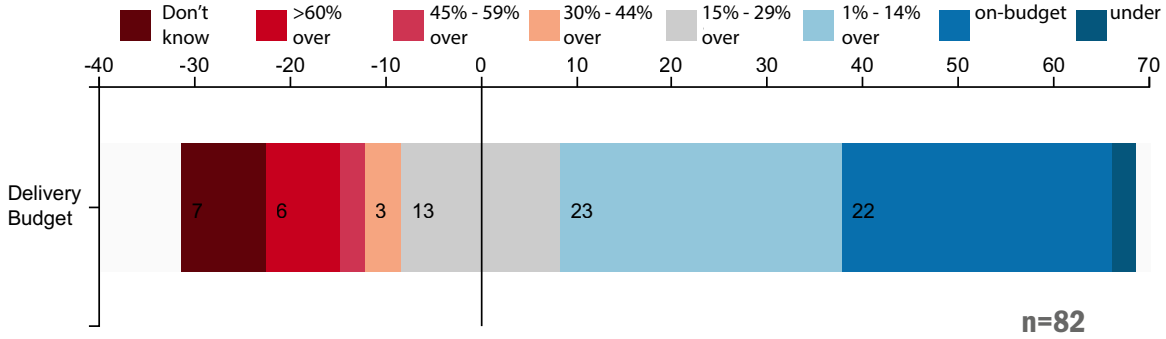
±14% within schedule



Meeting Budget Goals

75.4%

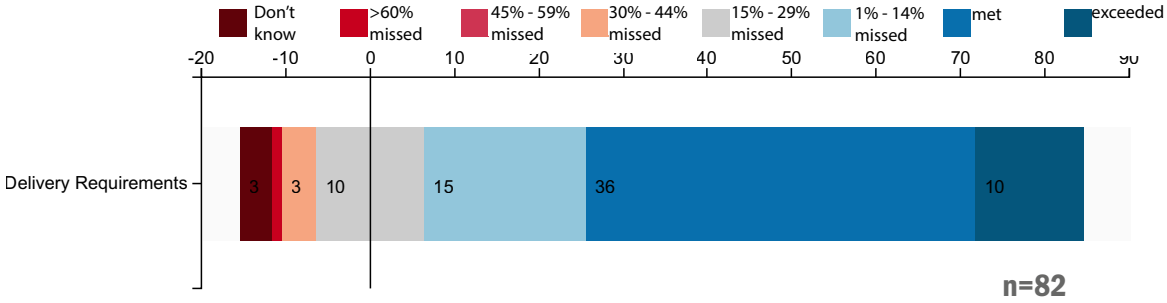
±14% within budget



Meeting Scope and Requirement Goals

88.0%

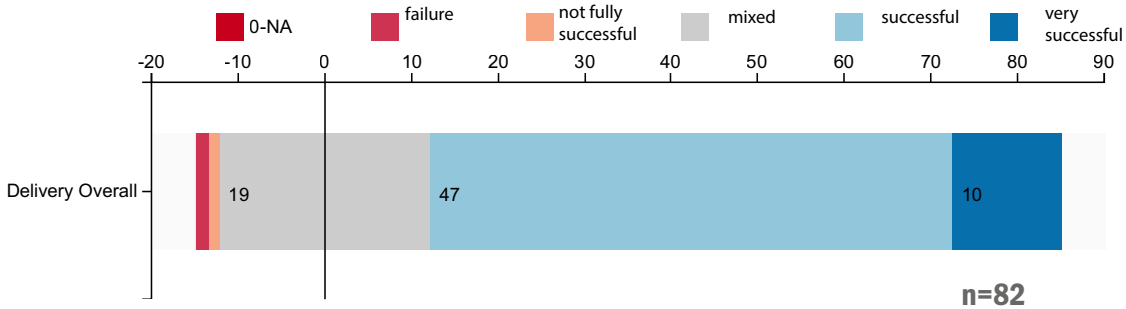
±14% goal achieved



Overall Success

85.3%

mixed-very successful



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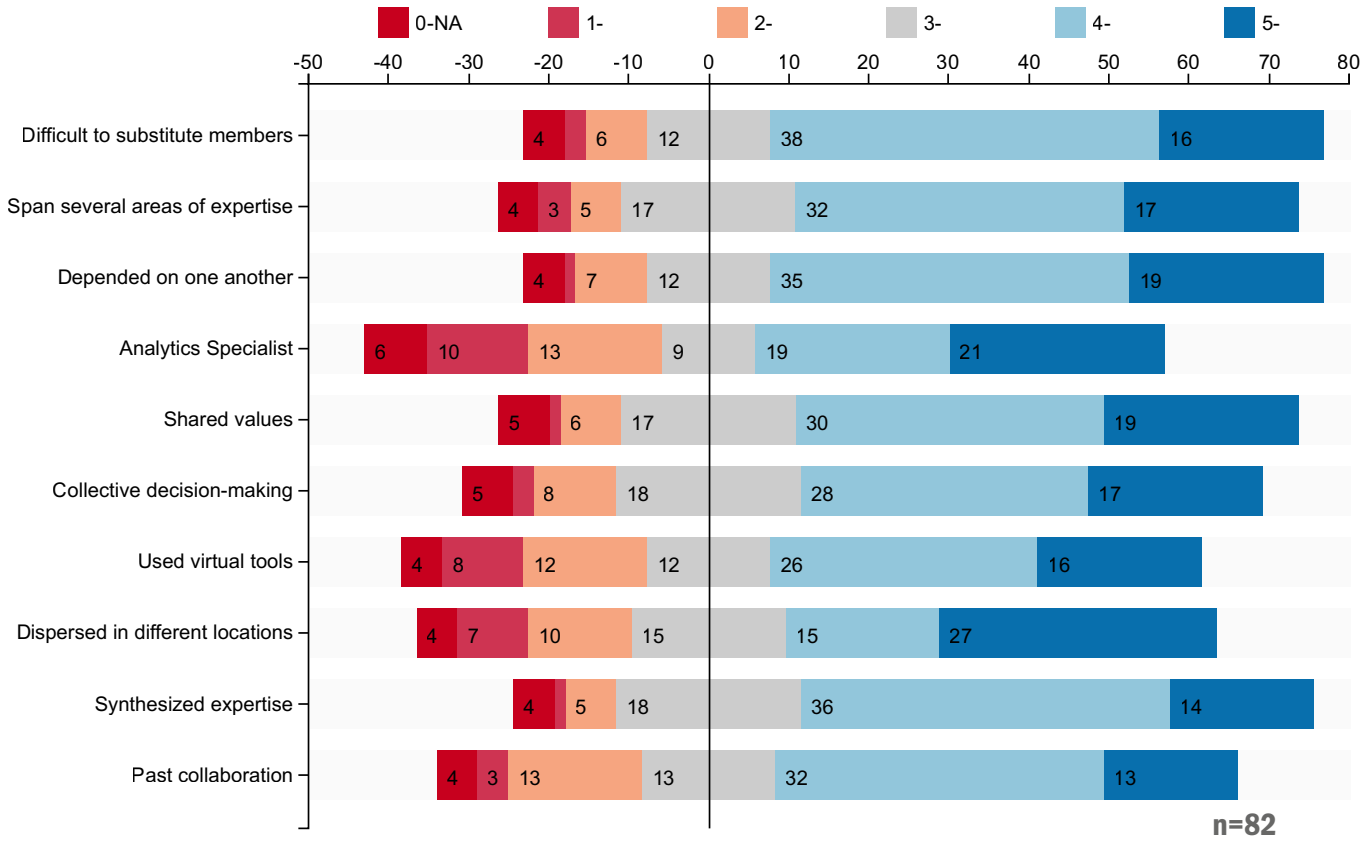
Project Stakeholders

Team Structure

The team structure describes how well characteristics or attributes matched the project team. Not Applicable (NA) was a selection criteria to exclude spurious answers when the respondent was not sure. The values for NA are shown in the diagram, but excluded from the reference line. The reference line is the boundary in the middle of the range from "1-Not at all" to "5-To a great extent."



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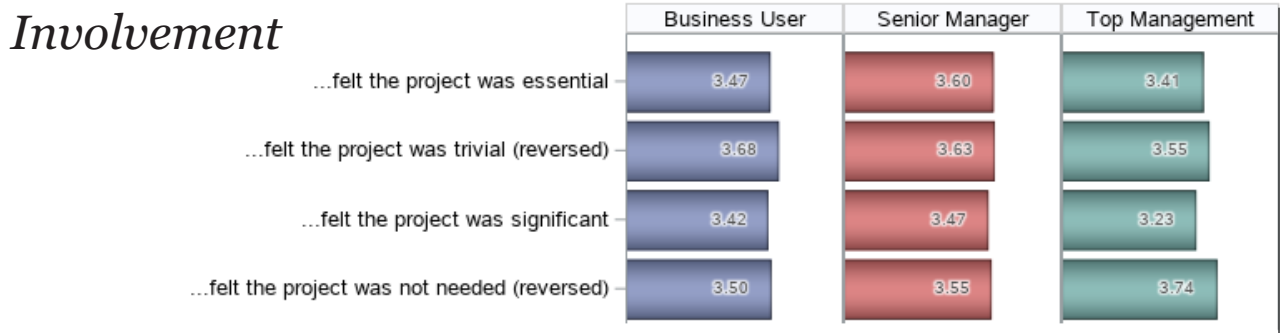
Stakeholder Contribution

Contribution to the project is divided into participation and involvement: Participation represents an active role in the development process and involvement represents the importance and personal relevance an individual places on the project. The data entry scale was the range from "1-Not at all" to "5-To a great extent" to identify the involvement and participation of the following project stakeholders. Blanks were permitted.

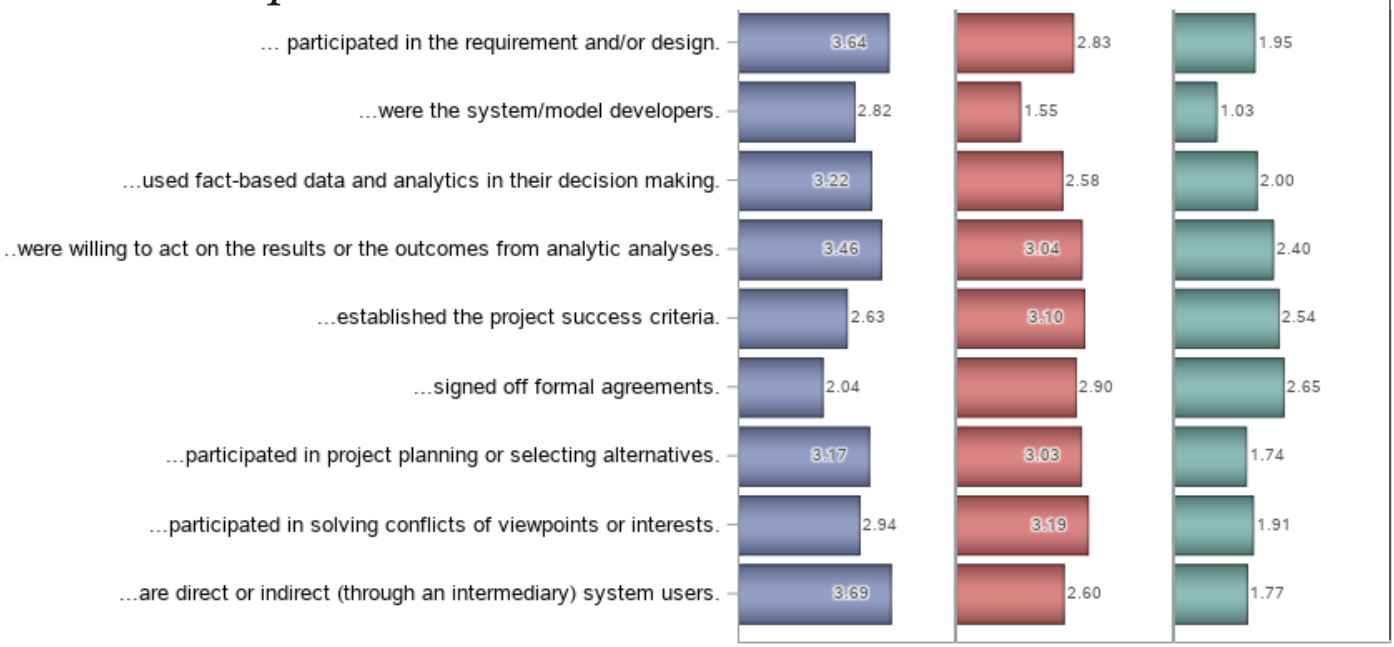
- Business Users are functional managers and staff members that execute short-term strategies and operational plans.
- Senior Managers are business and corporate managers that implement or execute strategic plans.
- Top Management is the board of directors, chief executive, and administrative officers that make strategic, long-term decisions on behalf of the organization.

While the degree of project participation varied between business users, senior managers, and top management, they all had similar levels of involvement.

Involvement



Participation



n=82

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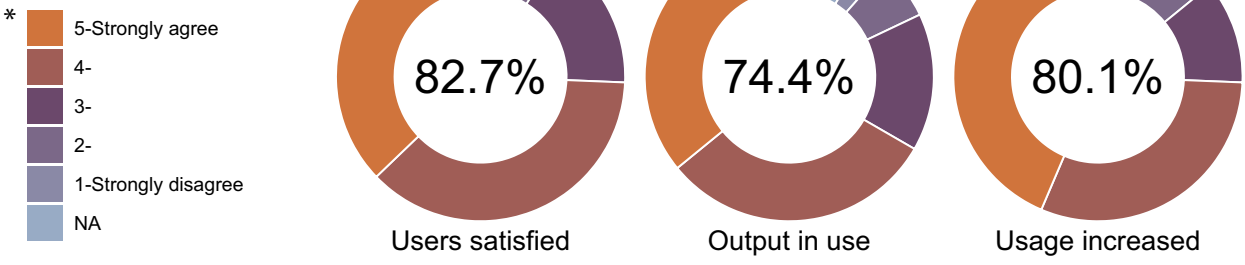
Organizational Impacts

In information systems, system use is a proxy to measure system success when system use is optional and user satisfaction is a proxy when system use is mandatory. The majority of the projects showed that the outputs of the projects were used, the users were satisfied, and the usage increased over time. Furthermore, the majority of projects had positive organizational impacts on costs and efficiency and strategic benefits such as preparing for the future. About half also had positive revenue impacts. Composite variables for system use and organizational performance were created for further analysis. The organizational performance variable excluded react quicker to changes and prepares for the future to maintain statistical reliability.

System Use



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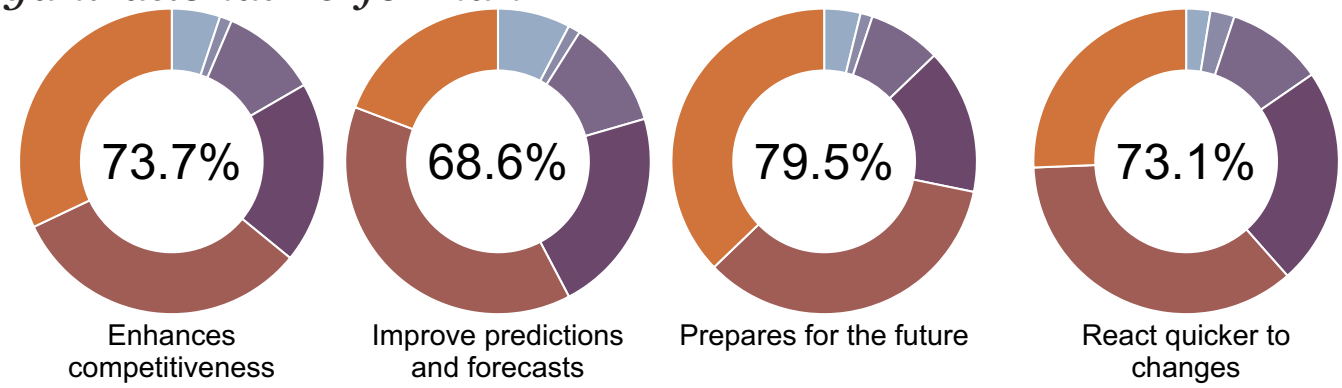
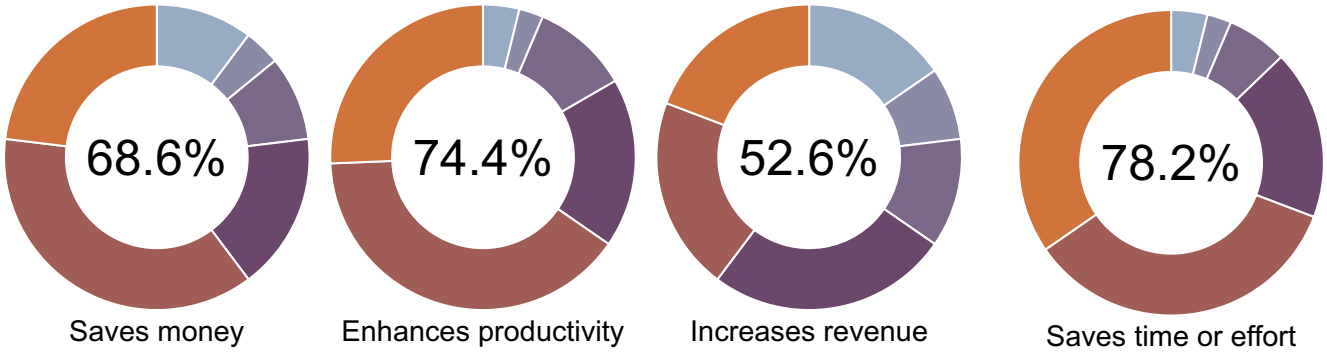
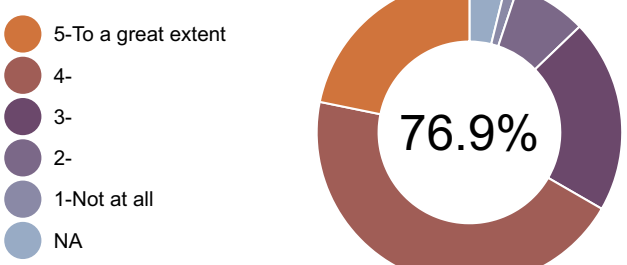
* The scale was reversed during data entry.

Organizational Performance







n=82

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2 Analysis

Project Clusters

Homogeneous Project Clusters

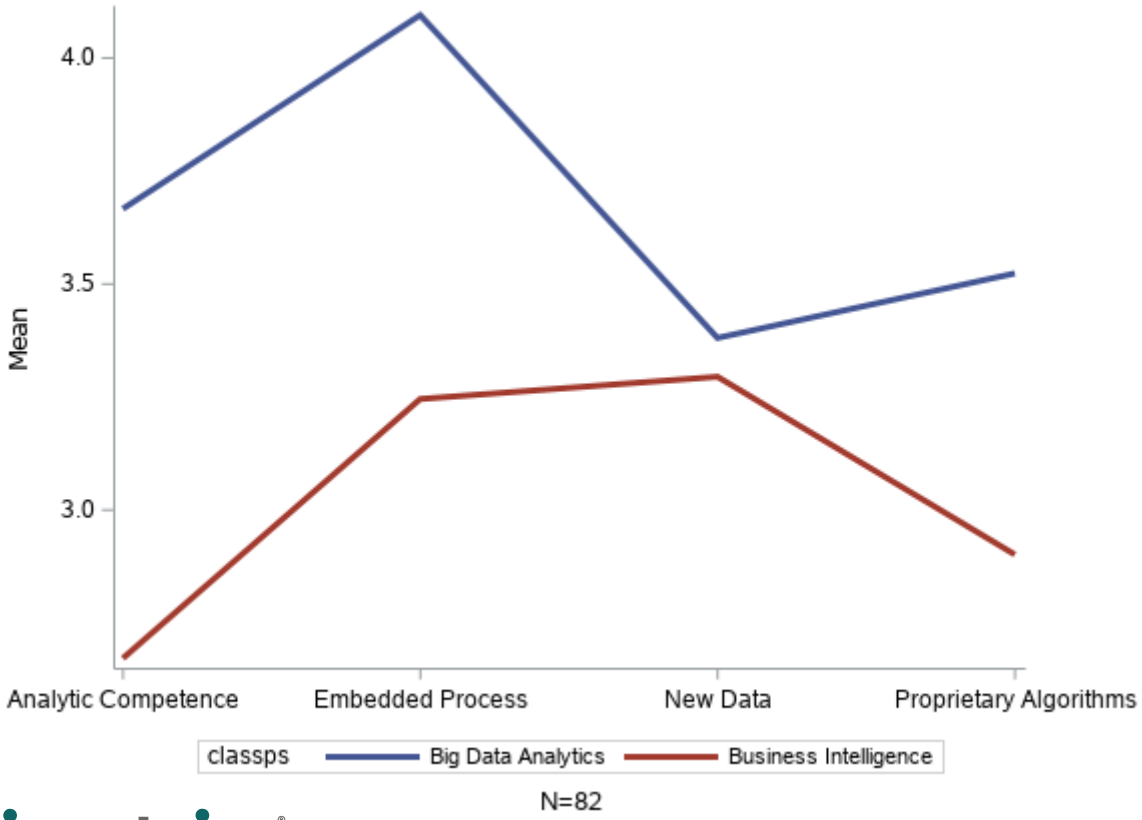
The latent class clustering technique was used to identify the homogeneous clusters with the four items for the project deliverables. Two-clusters were identified based upon the fit indicators and the qualitative review of the results. The delivery of algorithms and analytic competency provide the most differentiation between clusters. Thus, Cluster 1 was named Big Data Analytics and Cluster 2 was named Business Intelligence. The mean score ranking and Wilcoxon score and significance of the variables were computed for a comparative analysis between the two groups. The figure includes the mean distribution for the 2-cluster solution and the table includes the mean score for variables with a significant difference.

The project attributes and demographics were not significantly different between groups. The results suggest BI and big data analytic projects are differentiated based on analytics competence, and providing models or algorithms. However, both project types have a similar level of technology uncertainty and pace. Next, while top management contribution is a critical success factor for all type of projects, senior managers are significantly more involved in big data analytic projects than they are in BI projects.

	Variable	Mean Value	
		Big Data Analytics	BI
System Quality	Availability	4.38	3.82
	Integration	4.33	3.77
	Response time	4.24	3.59
Information Quality	Accuracy	4.19	3.48
	Completeness	4.24	3.64
	Data Variety	3.52	2.64
	Data Volumes	4.38	3.64
	Privacy	3.81	3.20
Service Quality	Accuracy	4.14	3.57
	Analytical competence	3.71	2.84
	Data competence	3.95	3.31
	Reliability	4.29	3.69
	Technical competence	4.19	3.77

	Variable	Mean Value	
		Big Data Analytics	BI
Class	Product Novelty	2.52	1.69
	Complexity	2.33	1.92
Team Structure	Depended on one another	4.38	3.44
	Analytics Specialist.	4.10	2.79
	Shared values	4.24	3.39
Perf	Enhances competitiveness or create strategic advantage	4.24	3.48
Project Scope	Embedded into distinctive business processes	4.10	3.25
	Proprietary algorithms or business models	3.52	2.90
	Data science or analytic competence	3.67	2.67

	Variable	Mean Value	
		Big Data Analytics	BI
Involvement & Participation	Top Management... felt the project was essential	4.14	3.18
	Top Management.... felt the project was significant	3.95	2.98
	Senior Manage... felt the project was essential	4.38	3.28
	Senior Manage... felt the project was significant	4.14	3.20
	Senior Manager.. participated in the requirement and/or design.	3.43	2.52



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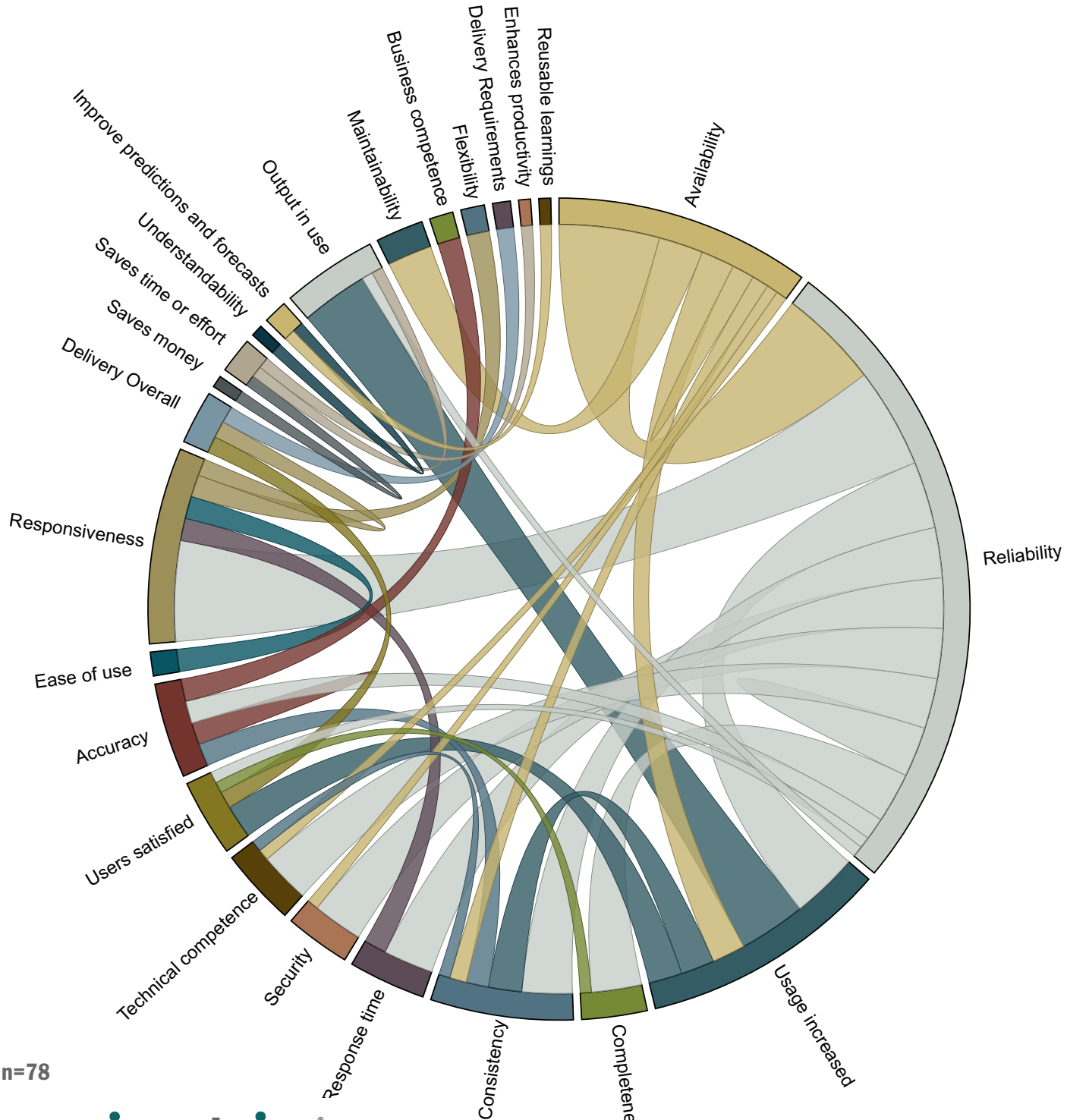
Variable Correlations

Correlations

Correlation analysis was used to establish the relationship between the variables. The following chord diagram shows the correlation between variables that are significant and strong (+/- .50); the width of the bar is relative to the strength of the relationship. Reliability and availability are the most prominent in the diagram and are correlated with usage (i.e., usage increased, output in use, and users satisfied). Output in use brokers the relationship to the organizational performance variables through saving time or effort. Correlation does not prove causation. The project efficiency measures of time and budget performance were not strongly correlated with the other performance measures.



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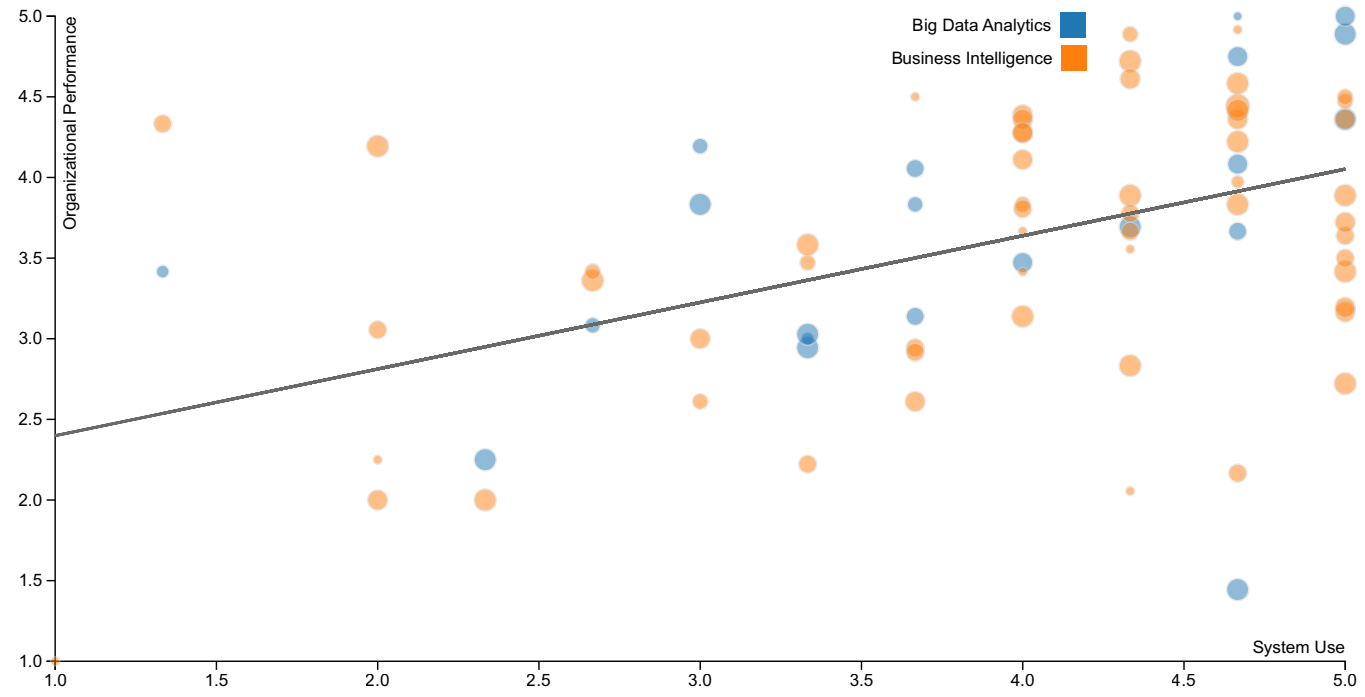
System Use Impact

System Use and Organizational Performance

The DeLone and McLean Information System success model was used as the basis for establishing the analysis framework to answer questions about the relationship between the success criteria and organizational performance. The model has six interrelated success categories — system quality, information quality, service quality, system use, user satisfaction, and net benefits. It assumes a time-based process flow and causal relationship of produce, use, and gain benefit. Hundreds of empirical studies have used the model and verified the success categories and their pair-wise associations. Furthermore, the model has been applied to and empirically tested on decision support systems.

The success categories were represented in the survey questionnaire; system use and user satisfaction were combined into one category and net benefits was represented by the organizational performance variables. The analysis confirms a positive relationships between system quality, information quality, and service quality to system use and from system use to organizational performance. And, on a 5-point scale for each unit of change in system use there is a 0.55 change in organizational performance. This suggests that in the short-term if the project focuses on ensuring system use and user satisfaction, the organization will benefit in the future long after the project is completed.

The graph is a scatter plot of system use to organizational performance with a regression line to show the trend. Each dot represents one of the cases in the survey and the color identifies its class based upon classification analysis.



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Predicting Success

Quality and Project Efficiency

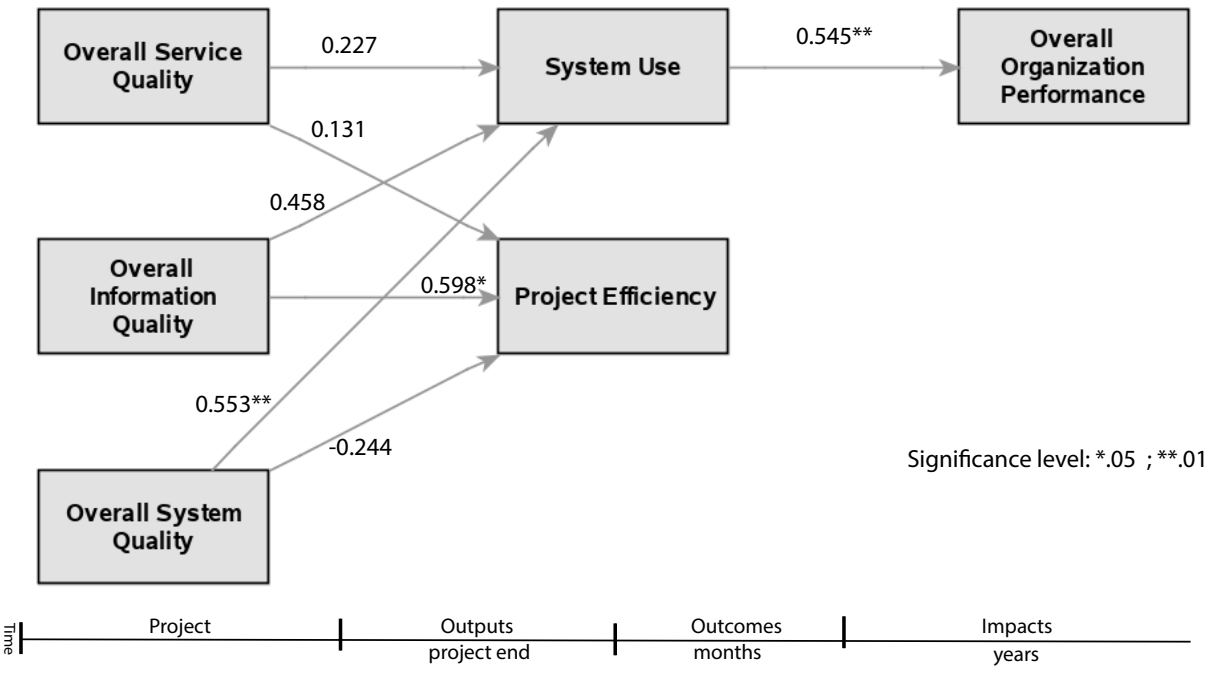
The analysis model was extended to analyze the relationship between quality and project efficency of time and costs. This topic is interesting because all research suggests that the requirements for DSSs are unstable, there are usually conflicting objectives, and that DSS projects fail to meet their objectives more often than other types of software projects.

The decision support quality was measured based on the system, information, and service quality. Project efficiency was measured based on the project performance against costs and time. The results confirm system quality does have a negative influence on both the time and cost performance of the project; the time influence was significant, while the cost influence was not. Information quality and service quality had positive influences on both the time and cost performance of the projects; however, only the relationships from information quality to time and service quality to cost were significant. The explanatory power was low so an additional study is needed to have generalizable results.

Quality - Project Efficiency - System Use - Org Performance

To analyze the most important question of the study- **which criteria during the project result in long term benefits after the project is completed?** — the DeLone and McLean model was extended to include the project efficency measures. The relationship between a project timeline and the model are shown in the diagram. The quality is delivered as part of the project. At the end of the project and months or years into the future, the system is used. The organization gains its benefits those months and years after the project is completed.

The overall model and the results are shown in the figure. System quality, in terms of ease of operations, performance quality, and sophistication of analytical tools, is the most important decision support quality factor. It negatively influences project efficiency and positively influences system use. Information quality is the second most influential factor with positive influences on project efficiency and system use. System use strongly influences organizational performance. The different fit statistics suggest that the model is valid. Nevertheless, the generalizability is limited due to the small sample size.



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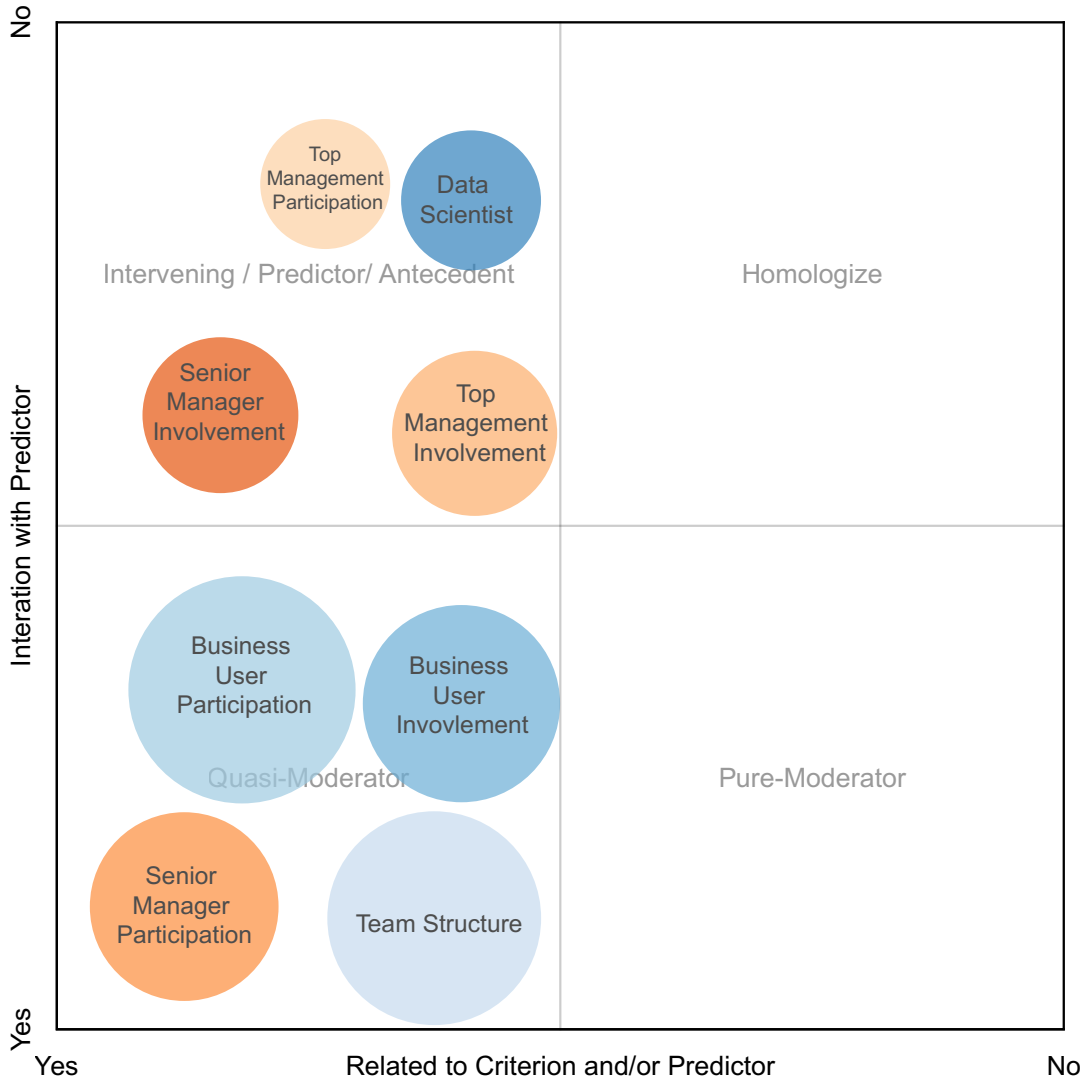
Stakeholder Impacts

Stakeholders - System Use - Org Performance

Moderation analysis was conducted for each of the stakeholders to judge their influence on the future benefits based upon their engagement in and perception of the project. The empirical analysis confirmed that system use and organizational performance were impacted by stakeholder participation and involvement in the project. The finding is that business users participation and involvement, senior management participation, and team structure change the nature or direction of the relationships between system use and organization performance. In general, these variables had a beneficial influences on organizational performance. Those variables also had a direct influence as an intervening, predictor, or antecedent so they were quasi-moderators. Senior manager involvement, top management involvement and participation, and data scientist participation did not have interaction as a moderator, but did have an influences as an antecedent, predictors, and intervening variable. That means, additional studies are required to fully understand their influence.

The matrix diagram shows the type of effect for the variable based on its quadrant position. The size of bubble gives a relative indication of the effect size.



Modelled after Sharma S. Durand, R. M. & Gur-Arie- O (1981)

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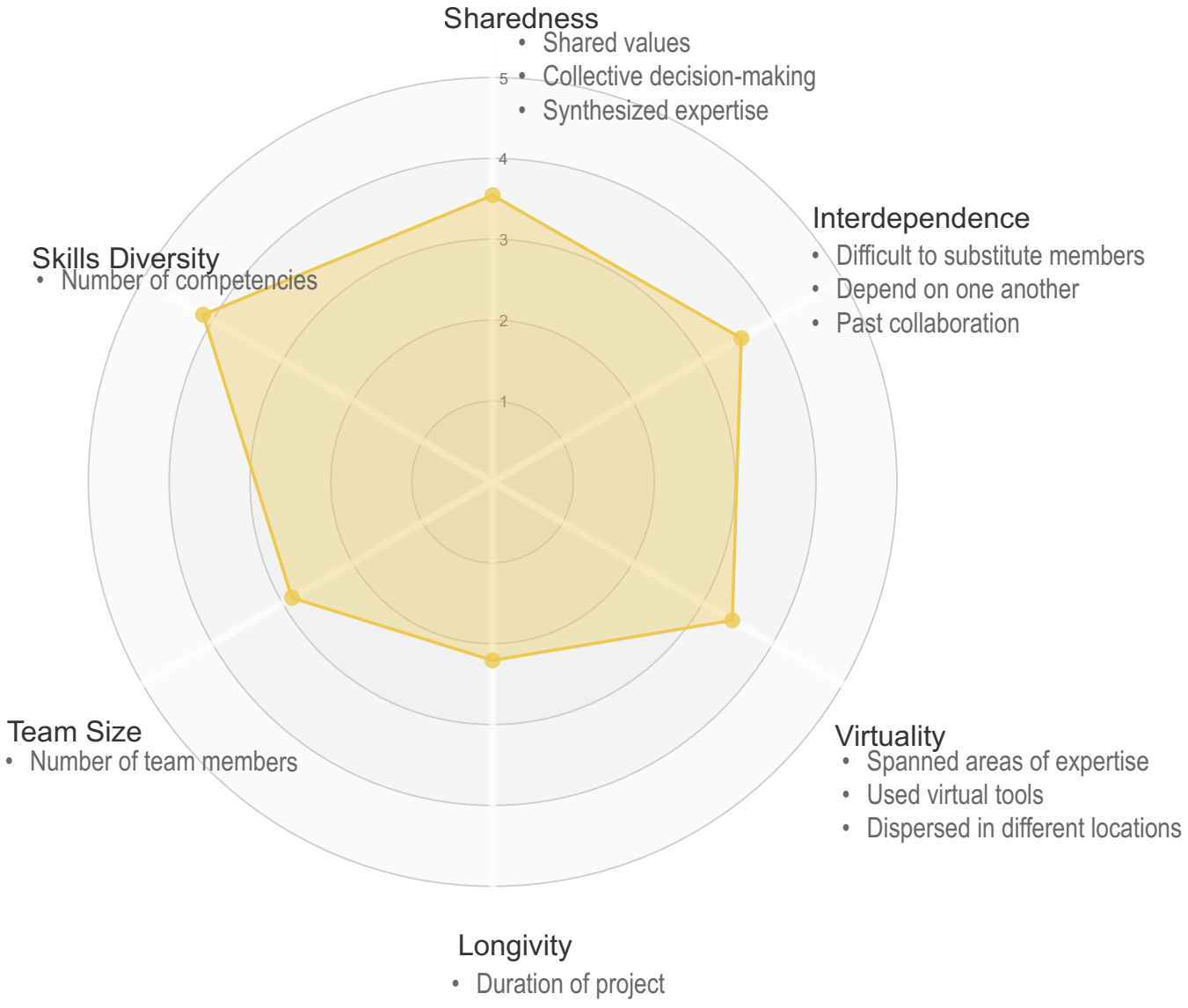
Team Dimensions

Multidisciplinary Team Structure

The analysis included factor analysis of the team structure variables to derive the dimensions from the data, and moderation analysis with the factors and project attributes to understand the impact of the dimensions on the relationship between the project output (i.e., system use) and organizational performance. Consistent with the literature, skill differentiation, interdependence, team size, team longevity, virtually, and shared values were the dimensions used to describe project teams. In most cases (77%), the teams had at least four different competencies involved. The analysis showed that high levels of virtuality and sharedness in the project team has a positive influence on organizational performance after the project is completed. The following radar chart shows the average ratings against a 5-point scale for each of the team dimensions and the variables that comprise the dimensions.



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References

The survey instrument and the research analysis were based upon the work of many giants in the information systems and project management worlds. Due to space reasons, not all references can be listed here. The following articles were used in constructing this research summary and could be useful for people that wish to explore the topic in more detail.

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