

INFORMATION SYSTEMS STRATEGY: RECONCEPTUALIZATION, MEASUREMENT, AND IMPLICATIONS

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Appendix A

Definitions of IS Strategy Related Terms in Literature

Term Used	Definition Provided	Source
I/T strategy	None provided	Henderson and Venkatraman 1999
Information Management Strategy	"A long-term precept for directing, implementing and supervising information management" (information management left undefined)	Reponen 1994 (p. 30)
	"Deals with management of the entire information systems function," referring to Earl (1989, p. 117): "the management framework which guides how the organization should run IS/IT activities"	Ragu-Nathan et al. 2001 (p. 269)

Term Used	Definition Provided	Source
Information plan	Tangible outputs of the SISP process	Brown 2004; Lederer and Salmela 1996
Information strategy	“A complex of implicit or explicit visions, goals, guidelines and plans with respect to the supply and the demand of formal information in an organization, sanctioned by management, intended to support the objectives of the organization on the long run, while being able to adjust to the environment”	Smits et al. 1997 (p. 131)
Information system(s) strategy, IS strategy	A comprehensive plan that includes the following components	Bajjaly 1998; Galliers 1991
	None provided; defines only <i>strategic information systems</i> , a term that is used synonymously: “IS used to support or shape an organization’s competitive strategy, its plan for gaining and maintaining competitive advantage”	Chan and Huff 1992 (p. 191)
	None provided	Galliers 1991; Hatten and Hatten 1997; Hayward 1987
	“Lays plans and sets standards a coordinated and integrated approach to the provision and management of systems over the next five years or more”	Hoey 1998 (p. 19)
	“Search for competitive advantage through its [IS/IT] use”	Duhan et al. 2001 (p. 38)
	None provided	Bacon 1991
	None provided; used synonymously with IT strategy	Tai and Phelps 2000
Information Technology Strategic Plan	None provided	Wexelblat and Srinivasan 1999
IS strategic plan	Used synonymously with IS strategy	Bajjaly 1998
IT Strategy	“Written plan comprised of projects for application of information technology to assist an organization in realizing its goals (derived from Lederer and Sethi 1996)”	Gottschalk 1999a (p. 78); Gottschalk 1999b (p. 115)
	“Using IT to gain competitive advantage”	Brady and Targett 1995 (p. 387)
	“Sustaining competitive advantage using IT”	Hidding 2001 (p. 202)
	“Document containing plans , intentions and policies for the organization’s current and future use of IT, and ‘softer’ IT related issues such as ...”	Brady et al. 1992 (p. 187)
	No explicit definition provided; referring to (Parsons 1983): “General frameworks which guide the opportunities of IT which are identified, the IT resources which are developed, the rate at which new technologies are adopted, the level of impact of IT within the firm”	Kanungo et al. 2001 (p. 31)
	Citing Parsons(1983): “central tendencies which firms use to guide IT/IS within the business”	Ward 1987 (p. 22)
	None provided; used synonymously with IS strategy	Tai and Phelps 2000
IT/IS strategy	“Ways in which IT/IS is used to deliver a strategy”; used indifferently with SIS; referring to (Wiseman 1985): “information systems used to support or shape the competitive strategy of the organization”	Atkins 1994 (p. 123)
Long-range IS planning document	“Long range/strategic planning” as “a process that considers three or more years into the future and involves the development of EDP/MIS objectives and the implementation of strategies and policies to achieve these objectives”	Conrath et al. 1992 (p. 367)
MIS plan	The “observable outcome” of “strategic IS planning”	Pyburn 1983 (p. 3)

Term Used	Definition Provided	Source
MIS Strategy Set	"Will guide the design and development of the MIS" as derived from the organizational strategy set"	King 1978 (p. 28)
Strategic information plan	"A portfolio of computer-based applications that will assist an organization in executing its business plans and realizing its business goals"	Lederer and Salmela 1996 (p. 237)
Strategic Information Systems Planning	"Identification and successful implementation of strategic information systems"	Galliers 1991 (p. 55)
Strategic plan for Information systems	"Output of the IS planning process"	Teo and Ang 2000 (p. 275)
Strategic plan for MIS	None	Ein-Dor and Segev 1978
Strategies for information systems	Used synonymously with IS strategy	Ward 1987

Appendix B

Literature Review Process

Following Webster and Watson (2002), our literature review began with a keyword search from several literature databases, giving access to a broad spectrum of international IS and business journals.² The extent to which leading journals according to the ISWorld³ ranking are covered is depicted in Table B1. We searched EBSCO/Business Source Complete, Proquest/ABI Inform, and Science Direct for the string "(Info* OR IT OR IS) AND strategy*" in title, abstract and keywords. This search resulted in 1,235 articles. (Full coverage of the journals can be found on the website of the respective databases.)

Some relevant articles are invariably overlooked in such a search while a large amount of irrelevant articles are found. In order to overcome these shortcomings we also conducted a manual scan of the titles and abstracts of all volumes (starting in 1970; before that, information strategy had not been discussed) and issues of leading relevant IS and business journals listed in the ISWorld ranking. Relevant for our purposes are high ranking journals that are most likely to cover strategic topics (e.g., by having strategy/strategic management in their title, or explicitly mentioned in their mission statement, as core topics). Table B2 summarizes the journals covered in this manual scan. The manual scan resulted in adding a further 419 articles to the 1,235 articles from the database search.

We then reviewed the abstracts of all articles of our literature base for relevance. This led us to exclude 1,253 articles (984 from the database and 269 from the manual search⁴) from the relevant literature base. The excluded articles were either not related to strategy as defined in the working definition or were not related to IS/IT in any way.⁵

Hence, this review left us with 401 articles that were somehow related to IS/IT and strategy. Our focus is on IS strategy and its content which is distinct from the process and the impact (see Figure 1). Grouping the 401 articles into these categories resulted in only 43 articles covering

²Since the focus is on the academic discussion, we excluded practitioner magazines, trade journals, etc. from the review. We also excluded non-scholarly contributions such as editorials or book reviews. These were only included if referenced by any of the articles included in the review.

³"MIS Journal Rankings," <http://www.bus.ucf.edu/csaunders/newjournal.htm>.

⁴A very broad filter was used in the manual search; we deliberately used the rule to include all articles that might somehow be related to IT/IS and strategy in order to be sure to not leave out any potential article. As scanning hundreds of articles can become a tedious job, no classification had been done at this point. This explains why in the later review step, a large number of articles were excluded from the literature base.

⁵A large number of articles can be attributed to this category since the EBSCO database does not allow specifying case sensitivity in search strings. As we had to include "IS" and "IT" in our search string, this resulted in including many articles containing the verb *is* or the word *it*.

the content of IS strategy⁶ (i.e., 358 articles covered either the *process* or the *impact*⁷). When reading these 43 articles in depth, we discovered references to 5 other articles covering the content of IS strategy, finally resulting in 48 relevant articles for this study.

Table B1. Coverage of International Top Journals by Database Search

Number	Journal Name	Starting Year	Starting Volume	Starting Issue	Source Used
1	MIS Quarterly	1977	1	1	EBSCO
2	Information Systems Research	1990	1	1	EBSCO
3	Communications of the ACM	1965	8 [†]	1	EBSCO
4	Management Science	1954	1	1	EBSCO
5	Journal of Management Information Systems	1984	1	1	EBSCO
6	Decision Sciences	1970	1	1	EBSCO
7	Harvard Business Review	1922	1	1	EBSCO
8	European Journal of Information Systems	1993	2	1	Proquest
9	Decision Support Systems	1997	19	1	EBSCO
10	Information & Management	1977	1	1	Science Direct

[†]We considered starting with Volume 8 as appropriate given the fact that this volume is from 1965. Hardly any information strategy related publications can be expected prior to 1970. This is confirmed by our analysis.

Table B2. Journals Included in Manual Search

Number	Journal Name	Starting Year	Starting Volume	Starting Issue	Primary Field
1	MIS Quarterly	1977	1	1	IS
2	Information Systems Research	1990	1	1	IS
3	Journal of Information Technology	1998	13	1	IS
4	Journal of MIS	1984	1	1	IS
5	IEEE Transactions on Engineering Management	1994	41	1	IS
6	Information & Management	1977	1	1	IS
7	European Journal of Information Systems	1992	1	1	IS
8	Journal of the Association of Information Systems (AIS)	2000	1	1	IS
9	Communications of the AIS	1999	1	1	IS
10	Journal of Strategic Information Systems	1991/92	1	1	IS
11	Management Science	1970	16	5	Business
12	Harvard Business Review	1970	48	1	Business
13	Academy of Management Journal	1970	13	1	Business
14	Academy of Management Review	1976	1	1	Business
15	Strategic Management Journal	1980	1	1	Business

⁶An article can cover multiple categories.

⁷In fact, the categories were derived bottom-up (i.e., by multiple rounds of grouping articles with similar research questions/topics) rather than top-down. Besides the three categories of process, impact and content, we also had the categories *implementation* and *alignment*. However, the articles in these categories did not cover the content of IS strategy.

Appendix C

List of the 48 Articles Examining IS Strategy and Their Conceptions

Article ID	Authors	Journal	Year	Volume	Issue
Conception 1: IS Strategy as the Use of IT to Support Business Strategy					
1	Duhan, S., Levy, M., and Powell, P.	European Journal of Information Systems	2001	10	1
2	Gottschalk, P.	Information & Management	1999	36	2
3	Gottschalk, P.	European Journal of Information Systems	1999	8	2
4	Gottschalk, P.	Long Range Planning	1999	32	3
5	Hatten, M.L., Hatten, K.J.	Long Range Planning	1997	30	2
6	Brady, T., and Targett, D.	Technology Analysis & Strategic Management	1995	7	4
7	Hoey, A.	International Review of Law, Computers & Technology	1998	12	1
8	Hidding, G.J.	Journal of Strategic Information Systems	2001	10	3
9	Atkins, M.H.	Journal of Strategic Information Systems	1994	3	2
10	Wilson, T.D.	International Journal of Information Management	1989	9	
11	Codington, S., and Wilson, T.D.	International Journal of Information Management	1994	14	
12	Chan, Y.E., Huff, S.L., Donald W., and Copeland, D.G.	Information Systems Research	1997	8	2
13	Chan, Y.E., Huff, S. L., and Copeland, D.G.	Journal of Strategic Information Systems	1997	6	4
14	Holland, C., and Lockett, G.	Journal of Strategic Information Systems	1992	1	3
15	Sutherland, E., and Morieux, Y.	Journal of Information Technology	1988	3	1
16	Chan, Y.E., and Huff, S.L.	Journal of Strategic Information Systems	1992	1	4
17	Venkatraman, N.	Journal of Management Information Systems	1985	2	3
18	Wilkes, R.B.	Information & Management	1991	20	1
19	Mason, R. M.	Journal of Management Information Systems	1991	8	2
20	Angell, I. O.	Journal of Information Technology	1990	5	3
Conception 2: IS Strategy as the Master Plan of IS Function					
21	Tai, L.A., and Phelps, R.	European Journal of Information Systems	2000	9	3
22	Henderson, J.C., and Venkatraman, N.	IBM Systems Journal	1999	38	2
23	Bajjaly, S.T.	American Review of Public Administration	1998	28	1
24	Conrath, D.W., Ang, J.S.K., and Mattay, S. J.	INFOR	1992	30	4
25	Bacon, N.	Journal of Information Technology	1991	6	2
26	Hayward, R.G.	Long Range Planning	1987	20	2
27	Lucas, H.C., and Turner, J.A.	Sloan Management Review	1982	23	3
28	Ein-Dor, P., and Segev, E.	Management Science	1978	24	15

Article ID	Authors	Journal	Year	Volume	Issue
29	King, W.R.	MIS Quarterly	1978	2	1
30	Peppard J. and Ward J.	Journal of Strategic Information Systems	2004	13	2
31	Ragu-Nathan, B., Ragu-Nathan, T.S., Tu, Q., and Shi, Z.	Journal of Strategic Information Systems	2001	10	4
32	Smits, M.T., van der Poel, K. G., and Ribbers, P. M. A.	Journal of Strategic Information Systems	1997	6	2
33	Lederer, A.L., and Salmela, H.	Journal of Strategic Information Systems	1996	5	3
34	Smits, M. T., and van der Poel, K.G.	Journal of Strategic Information Systems	1996	5	2
35	Brady, T., Cameron, R., Targett, D., and Beaumont, C.	Journal of Strategic Information Systems	1992	1	4
36	Pyburn, P. J.	MIS Quarterly	1983	7	2
37	Adler, P.S., McDonald, D. W., and MacDonald, F.	Sloan Management Review	1992	33	2
38	Wexelblat, R. L., Srinivasan, N.	Information & Management	1999	35	
39	Das, S.R., Zahra, S.A., and Warkentin, M.E.	Decision Sciences	1991	22	5
40	Reponen, T.	Information Systems Journal	1994	4	
41	Flynn, D.J., and Hepburn, P.A.	European Journal of Information Systems	1994	3	3
42	Galliers, R.D.	European Journal of Information Systems	1991	1	1
10	Wilson, T.D.	International Journal of Information Management	1989	9	
11	Codington, S., and Wilson, T.D.	International Journal of Information Management	1994	14	
43	Allen, D.K., and Wilson, T.D.	International Journal of Information Management	1991	16	4
44	Teo, T.S. H., and Ang, J. S. K.	Behaviour & Information Technology	2000	19	4
45	Abdul-Gader, A.H.	International Journal of Information Management	1997	17	1
Conception 3: IS Strategy as the Shared View of IS Role within the Organization					
21	Tai, L.A., and Phelps, R.	European Journal of Information Systems	2000	9	3
23	Bajjaly, S.T.	American Review of Public Administration	1998	28	1
46	Ward, J.M.	Long Range Planning	1987	20	3
31	Ragu-Nathan, B., Ragu-Nathan, T. S. , Tu, Q., and Shi, Z.	Journal of Strategic Information Systems	2001	10	4
47	Kanungo, S., Sadavarti, S., and Srinivas, Y.	Journal of Strategic Information Systems	2001	10	1
48	Nolan, R., and McFarlan, F. W.	Harvard Business Review	2005	83	10
36	Pyburn, P. J.	MIS Quarterly	1983	7	2
37	Adler, P. S., McDonald, D. W., and MacDonald, F.	Sloan Management Review	1992	33	2
38	Wexelblat, R. and Srinivasan, N.	Information & Management	1999	35	

Appendix D

Development of IS Strategy Measures

To test the validity of our proposed measurement items of IS strategy typology, we employed a field survey methodology to collect data for the research instrument. Because the definition of IS strategy suggests that the strategy is an agreed upon organizational perspective of how to invest and deploy information systems, we sent separate questionnaires to the CIOs and their matched top business executives in a variety of industries. Consistent with prior research, the CIO is defined as the highest-ranking IS executive within the organization (Armstrong and Sambamurthy 1999; Grover et al. 1993). Top business executives include CEOs and business executives who are either formal members of the organization's top management team (TMT) and/or report directly to the organization's CEO. We asked the CIO and business executives to independently assess their organization's IS strategy via the questions. The scale used for these questions ranges from strongly agree (5) to strongly disagree (1).

A dual-stage matched sampling strategy was employed for the distribution of the CIO and business executive surveys. In the first stage, a total of 3,763 surveys were sent to a list of CIOs from organizations based in the United States. The CIO contact information was derived from the Dun & Bradstreet Million Dollar Database and from several professional industry associations. A total of 451 CIO surveys were returned for a total response rate of 12.0 percent for the first stage survey. In the second stage, a second instrument was sent to the selected top business executives of each organization for which we had received a completed CIO questionnaire. Business executives were identified through secondary data sources (Dun and Bradstreet Million Dollar Database and corporate websites) and were contacted within six months of collecting the CIO data. A total of 174 of the 451 organizations returned at least one business executive survey yielding an organizational response rate of 38.6 percent for the second stage survey. Non-response bias was assessed (via ANOVA) by comparing the total annual sales and number of employees for the responding organizations to that of all non-responding organizations (within the same primary SIC code) and by comparing the responses to IS strategy measures between early and late respondents. Our assessment revealed no issues with regard to response bias. In total, we derived responses from 174 matched pairs of CIOs and corresponding top business executives within the organization. We conducted an exploratory factor analysis using the responses from both the CIO and business executives from the 174 organizations to assess the psychometric properties of the scales in terms of item loadings and discriminant validity. The results are presented in Table D1.

The results of the factor analysis suggest that the CIOs and the business executives are consistent in their assessment of the organization's IS strategy. The significant factor loading coefficients confirm the convergent validity of the three types of IS strategies. We observe that both the CIO and business executives can cleanly attribute their organization's IS strategy to that of an IS innovator, IS conservative, or undefined IS strategy. Also, all of the nine questions were assessed similarly by both the CIOs and business executives. Specifically, we observe that all three innovator strategy items, conservative strategy items, and undefined strategy items load highly on their respective constructs and that there is a limited level of cross-loading of these items. To further our validation of the instrument across both IS executives and business executives, we also assessed the level of agreement between strategic decision-makers of the organization. We calculated this level of strategic agreement through r_{wg} in accordance with prior literature (James et al. 1984). The r_{wg} coefficient ranges from 0 (indicating complete disagreement) to 1 (indicating complete agreement). Prior research suggests that r_{wg} values greater than or equal to 0.60 suggest a high level of agreement and allow for the aggregation of individual responses if warranted (Glick 1985). For the 174 organizations, we examined the level of agreement between each of the strategy measures. Overall, we had a level of agreement among business executives (where we have multiple responses from business executives of the same firm) and a high rate of agreement between the CIO and these business executives (mean above 0.80) as summarized in Table D2. These findings provide additional support that these IS strategy measures can properly be assessed by either the CIO or business executives within the organization.

Table D1. Factor Analysis for IS Strategy Measures

Factor	CIO Factor Analysis			Business Executive Factor Analysis		
	1	2	3	1	2	3
Innovator1	.808	.135	-.129	.858	.195	-.263
Innovator2	.850	-.103	-.010	.908	.006	-.156
Innovator3	.787	.057	-.211	.822	.286	-.222
Conservative1	-.088	.806	-.144	.035	.733	-.139
Conservative2	.149	.804	-.245	.284	.716	.002
Conservative3	.022	.777	-.225	.089	.720	-.302
Undefined1	-.143	-.266	.889	-.186	-.152	.930
Undefined2	-.079	-.172	.913	-.177	-.097	.929
Undefined3	-.265	-.327	.684	-.349	-.312	.711

Table D2. Inter-Rater Agreement

	CIO Average [†]	Business Executive Average [†]	Overall Average	Mean r_{wg}	Median r_{wg}	% of pairs with $r_{wg} > 0.60$
Innovator	2.84	2.81	2.83	0.86	0.94	90.8%
Conservative	3.68	3.70	3.69	0.81	0.94	84.6%
Undefined	2.16	2.32	2.24	0.80	0.92	86.2%

[†]Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree