On the Determinants of the perceived value of enterprise-wide health information systems

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Focus of Study

- This study attempts to improve our knowledge about the major factors that influence the perceived value of health information systems.

- The rationale is that in order to guarantee continuous and effective utilization of an information system after rollout, end users must perceive or recognize that the system delivers value or benefits.

Problem justification

- Health care industry – devoting large sums of money to investments in health information and decision support systems
- Estimated US expenditure in HIT range from $11-15 billion (1977) to $17-42 billion (2004)
- Only 16.2% are successful; 31% are outright failures and 52.7% are partially successful
- How do health care workers value health information systems and what is the impact of these on work practices?

Literature Review

- Few studies looking into large enterprise-wide HIS
  - Methodological complexities
  - Lack of “gold standard” for evaluation

- Evidence that implementation of HIS has resulted in unforeseen costs, unfulfilled promises and disillusionment (Anderson and Jay, 1987; Lyytinen and Hirschheim, 1987)

- HIS also affect structure and functioning of organizations

Literature Review (2)

- Implementation success = realizing the intended benefits of the information system (Nelson, 1990).

- Previously, variables used to represent this construct have included [Doll & Torkzadeh (1988); Kjerulff, Counte, Salloway, & Campbell (1981); Schultz & Slevin (1975); Kaplan & Duchon (1989)]:
  - system use,
  - decision-making performance,
  - timeliness of decision-making,
  - user's satisfaction with the system and
  - user attitudes towards information systems

Literature Review (3)

In order to evaluate information systems one needs to consider a number of aspects:

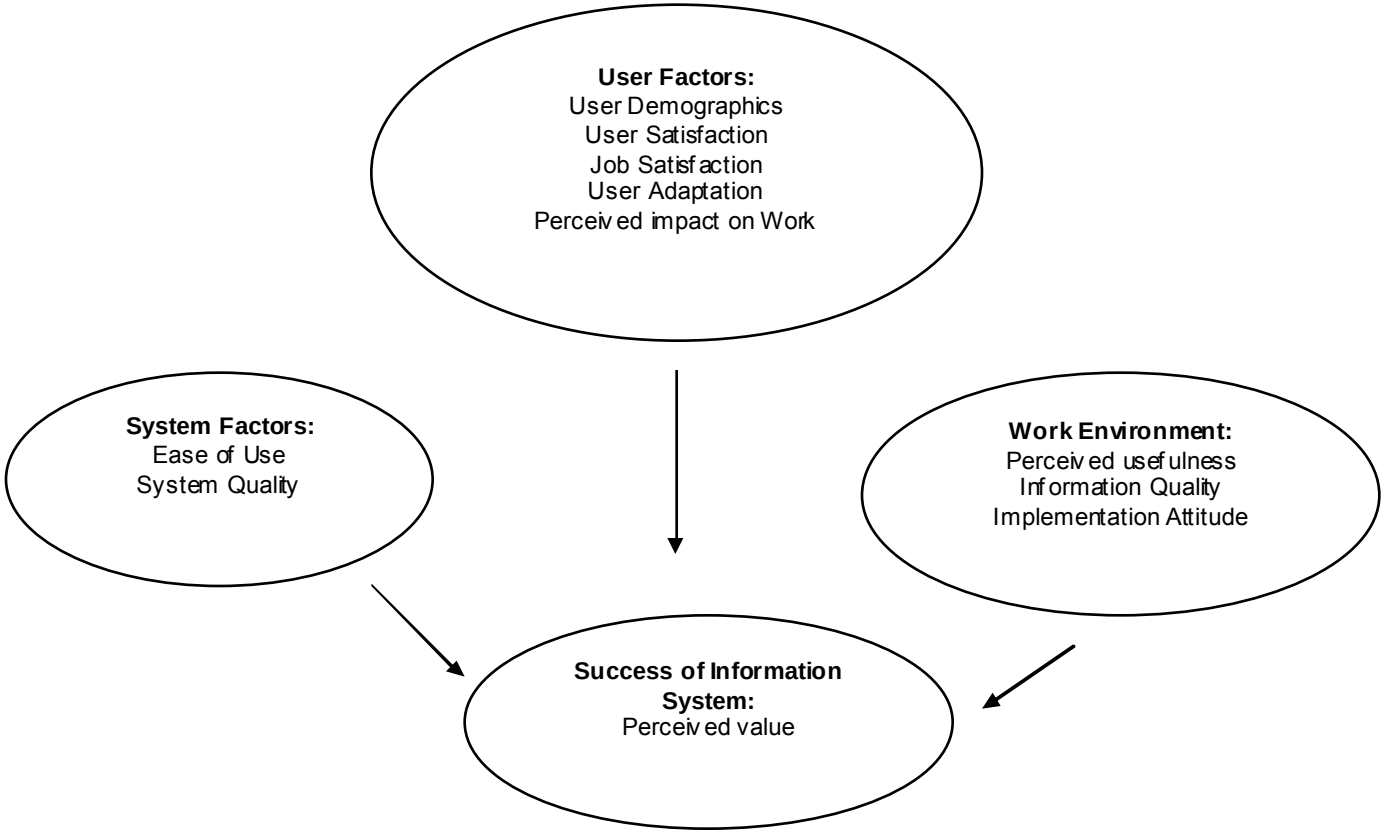
- The technology itself
  - system quality,
  - information quality and
  - ease of use
- The individuals who use the system
  - attitudes,
  - behavior,
  - qualifications,
  - gender,
  - age,
  - user satisfaction with the system
  - perceived value of the information system
- The organization in which those individuals work

Hypothesis

This study hypothesized that ***perceived value*** of the computerized information system is related to:

- the degree to which functionalities are met
- increased user satisfaction
- job satisfaction
- positive impact of the computerized information system on work
- better user adaptation and
- positive user attitude.

Selection of Attributes



Data Sources

- Illinois Department of Human Services (IDHS)
  - Office of Prevention Bureau of Youth Services and Delinquency Prevention (BYSDP).
- Scattered around the Illinois State.
- No system connecting these agencies in order to share information.
- Each agency - own system for collecting client information and assessing client risk levels.

Data Sources (2)

- eCornerstone - seen as a means to standardize risk assessment, and enable agencies to share information on clients, and report information to IDHS.

- Users of the eCornerstone system - mandated to use the system.

- The eCornerstone system - made up of 5 main components:
  - Intake (obtaining patient details)
  - Enrollment (into program and services)
  - Assessment (of needs within the program)
  - Case plan (for change in behavior of the client. These are tailored to the assessment outcome)
  - User administration function (overall management to oversee the processes)

Users of System

- In large agencies, intake and enrollment are done by one user (usually a data clerk), and the assessment and case plan functions are done by another (case worker).
- In other agencies, all of these 4 components are done by the case worker.
- The last component, viz. the user administration function, is done by supervisors and managers.
- With the assistance of senior staff from IDHS the tasks that could be undertaken by employees of the BYSDP were broken down into 31 functionalities. The functionalities are presented in more detail in Table 1

Functionalities

User Group	Tasks
Data Clerks/Case Worker	F1: Record participant information on intake/ Registering a client
	F2: Record information on participant's family/support
	F3: Obtain a participant's program related information and officially enrolling them in a program
	F4: Check to see if participant is already active in a program in another agency
	F5: Obtain consent from participant for sharing participant information
Case Worker	F6: Create a new assessment for a new/existing participant
	F7: Conduct a pre assessment on the participant to determine overall risk level
	F8: Conduct a full assessment on the participant to identify patterns of risk and protective factors
	F9: Link a completed assessment and a case managed program for each participant
	F10: Determine a participant's life risks/highest risk areas
	F11: Determine recommended services for a participant in order to reduce these life risks
	F12: Create a case plan for the participant
	F13: Obtain a summary of assessments associated with a selected participant
	F14: Obtain a summary of case plans associated with the selected participant
	F15: Keep progress notes on participants
	F16: Document the hours applied to participant related activity and hours applied to non-participant related activity
	F17: Keep track of items that are due, or of items that are scheduled for a current date
	F18: Refer a participant to the appropriate provider
	F19: View participant assessment history by assessment type, status, completion date and overview result
	F20: Close a Case Plan
	F21: Share information on participants Statewide

Functionalities (2)

Managers	F23: Assign a new case, or assign, reassign or close an existing case to a case worker
	F24: Select and assign/reassign multiple participants to a Case Worker
	F25: Open, maintain and update personnel information/records
	F26: Update Agency/Organization information such as telephone numbers, personnel information, etc.
	F27: Measure the performance of the agency
	F28: Review the case list for each assigned case worker
	F29: Monitor work performance of individuals in an agency
	F30: Obtain information for planning services at the agency
	F31: Compile quarterly reports grouped by demographic values that include referral sources, referral reasons, age, sex and ethnicity for new enrollments and terminations

Variables and Equation

- The dependent variable is Perceived Value of eCornerstone to the users.
- Users were asked to rate the eCornerstone system on a scale ranging from 0 to 100, where 0 represents no value and 100 represents high value.
- Perceived value is a consolidated measure, representing the net benefits of the web-based system over and above the paper-based system it replaced.
- The overall equation tested was as follows:

$$y = \beta_0 + \beta_1 X_1 + \ldots\ldots \beta_n X_n + \varepsilon$$

where,

β_0 is the constant term,

β_i represents parameter coefficients, and

ε represents the error term.

Independent Variables

X variables

- Age (years),
- gender (male, female),
- length of use of system (months),
- expectations (no change, automate, informate, transform),
- actual changes (no change, automate, informate, transform),
- content, accuracy, format, ease of use, timeliness,
- job satisfaction,
- impact on work (task productivity, task innovation, customer satisfaction, management control),
- interpersonal factors, personal hassles,
- daily work flow impact,
- data needs,
- job title,
- use scale and change scale.

Methods

- Respondents were mailed self-administered surveys.

- The survey was divided into:
  - Section assessing design-reality gaps (functionalities).
  - Section with standardized tools measuring the variables of interest.
  - Qualitative section to get more depth on areas of satisfaction and dissatisfaction.

Sampling Methodology

- Respondents were employees of the Bureau of Youth Service and Dependency Program (BYSDP) in the IDHS.

- Total sampling of the 855 BYSDP users that have already been migrated onto the eCornerstone platform from the paper-based system was conducted.

- Respondents were post stratified according to job title (Data clerk, case worker or manager).

Descriptive Statistics

Variable	Mean	Std Deviation	Minimum Value	Maximum Value
Age (in years)	35.42	10.36	18	70
Length of Use (in months)	12.90	11.65	1	49
Functionality Expectation Value	50.22	26.34	5	124
Functionality Actual Change Value	48.37	28.15	5	124
Perceived value	47.75	27.27	0	95
End System Computing Satisfaction	35.31	10.72	12	60
Impact on Work	22.38	10.65	11	55
Implementation Attitudes (IP, PH, DF)	27.41	6.76	3	40
User Adaptation: Use Scale	5.89	2.59	2	12
User Adaptation: Change Scale	8.39	2.62	5	15
Data Needs	2.18	1.36	1	5
Job Satisfaction	19.39	2.97	11	25

Research Results

- A total of 257 surveys were returned (30% response rate).
- Of these 253 were deemed usable for further analyses.
- Females – 72%; Males – 28%
- Case worker – 49%; Manager – 44.4%
- User indicate that the HIS had only a little impact on their work.
- Overall, users were satisfied with the system.
- The mean score of the Use scale variable shows that the users had problem with the system several times a week.
- The results of the Change scale show that the system had no effect to a slightly negative effect on their job.
- Only 20-40% of the users' data needs were met by the new system.

Regression Results

Variable	Parameter Estimate	Standard Error	P Value
Intercept	48.57	25.02	0.055
Age	-0.22	0.17	0.1928
Gender	-5.33	3.16	0.0945
Job Title	3.77	2.98	0.2093
Length of use	0.07	0.13	0.5986
Expectations	-0.03	0.11	0.7699
Actual changes reported	0.07	0.09	0.4358
Content	1.21	0.69	0.0844
Accuracy	-0.15	1.31	0.9081
Format	0.02	1.51	0.9901
Ease of Use	1.97**	0.95	0.0421
Timeliness	0.07	1.05	0.9491
Impact on Work	-0.02	0.27	0.9442
Interpersonal Hassles	0.24	0.84	0.7746
Personal Hassles	0.44	0.72	0.5371
Daily work flow	-3.71**	1.29	0.005
Use Scale	-3.11**	0.78	0.0001
Change Scale	1.83**	1.02	0.0747
Data needs	3.32**	1.47	0.0254
Job Satisfaction	-0.15	0.59	0.7974

** statistically significant at the 5% level.

Discussion

- Perceived value is higher if the following conditions were satisfied:
  - The system must be easy to use, must not break down often, must meet the data and information needs of the users, and fit into the work processes of the users.

- If the system does not capture all relevant data, users are more likely to complement the information system with legacy and/or paper-based systems in order to perform their daily activities. The use of such private systems ultimately results in decreases in overall system efficiency.

Conclusion / Recommendations

- Dissatisfaction and low perceived value of an information system will lead to minimal use of the system under mandatory conditions.

- With complex systems like public health systems, poorly designed systems can lead to poor or incomplete information capture which, can negatively impact budgeting, planning, and management functions.

- Unless, better systems are designed to capture the richness of the interactions between the providers and clients or provide sections where providers can make notations, paper systems will continue to coexist with electronic systems.