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Assessing hospital information systems processes: A validation of PRISE information systems success model in healthcare

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ABSTRACT

Although there is limited research and evidence base, it is reasonable to expect that high quality information technology is an integral factor in the success of today's health care sector. However, the health care sector is considered to be low level investor in Information Technology (IT) when compared to other sectors. There are studies that look at the sums spent on health IT as a basis for determining how effective the IT systems are. We support the idea that the effectiveness of IT systems, is not an exact measure and a more systematic approach needs to be taken when evaluating success of an IT system. In this study, we have evaluated an assessment method, which is, "Process Based Information Systems (IS) Effectiveness (PRISE)" based on a novel model of IS effectiveness in the health care sector. The results of our case series provide specific implications concerning the applicability of a general "IS assessment" approach, in the medical context.

Keywords

Information systems effectiveness, information systems evaluation, information systems success, information system process maturity, information technology management, health care.

INTRODUCTION

Health care organizations and patients can benefit greatly from the appropriate and effective use of information systems (Kaushal, Barker and Bates, 2001). Effective implementation of information technology (IT) in health care has the potential to save billions of dollars while reducing morbidity and mortality (Chaudhry et al., 2006). Empirical research has shown that effective information systems in healthcare organizations are associated with reduced costs and with better care and organizational performance (Chang and King, 2005; Li and Ye, 1999), which suggests a connection between IS process improvement and organizational effectiveness. However the impact of IS implementations are hard to measure and identify (Jayasuriya, 1997). Researchers also suggest that the impact of IS is usually accidental rather than planned (Borum and Christiansen, 2006).

While the effectiveness of information systems (IS) is recognized as an important issue, the definition of IS effectiveness in the information systems literature is not yet mature and consistent (Ozkan, Hackney and Bilgen, 2007;). Various models such as Capability Maturity Model (CMM/CMMI) (SEI, 2007), Control Objectives for Information Technology (COBIT) (ISACA, 2007) and Information Technology Infrastructure Library (ITIL) (OGC,2007), have been proposed and used by the IT industry (Ozkan et al, 2007). IS management and evaluation frameworks are not limited to the above mentioned and the list includes approaches that range from the generic ISO 9001 (Braa and Ogrim, 1995), Six Sigma (Schroeder, 2007), and EFQM (EFQM, 2006; Donahue and Vanostenberg, 2000) models through IT specific models such as SPICE (SEI, 2007), ISO 9126, ISO 20000 (ISO,2007), to healthcare-IT specific models such as Q-Rec (Q-Rec,2007), Joint Commission International Information Management Standard (Donahue and Vanostenberg, 2000) and HIS-Monitor (Ammenwerth et al, 2007). Each of these approaches has a distinct focus, and its own strengths and weaknesses.

In their seminal review paper, DeLone and McLean defined IS success in terms of success in six categories. These categories were system quality, information quality, user and user satisfaction, individual impact and organizational impact (DeLone and McLean, 2003). In 2003, they revised their model to include service quality as another quality category and they united individual and organizational impact into one "net benefits" category (DeLone and McLean, 2003).

Proper evaluation and assessment is essential for the ongoing improvement of information systems. Yet, a great number of studies that evaluate the organizational aspects of hospital information systems are based on exploratory methods (i.e. do not test a pre-defined hypothesis) (Ammenwerth and Keizer, 2005). Objective and explanatory measurement methods are needed to better evaluate organizational aspects of IS, both in general IS and in HIS context. Another deficiency of the IS evaluation studies is that the evaluated system usually has a limited focus (Ammenwerth and Keizer, 2005), either in functionality or localization (i.e. departmental systems). Among the explanatory studies that utilize formal assessment and/or measurement data rather than user feedback or satisfaction, there are very few studies that have a wider focus and evaluate enterprise-wide systems (Ammenwerth and Keizer, 2005)

It is logical to think that there must be a strong relationship between “improvement in managing IS” and “overall performance of the organization” as measured by effectiveness. Systematic measurements are needed to test this hypothesis. The first step in attracting attention to this area is to review the current level and status of information systems management practices. As Eccles (1991) says, "What gets measured gets attention". To improve the current status we need to measure IS management and IS effectiveness, although effectiveness is extremely hard to measure (Borum and Christiansen, 2006) because of the highly complex “sociotechnical systems” that make up an information system.

DeLone and McLean emphasize the need for a validated measuring instrument which could provide a standardized evaluation of information systems effectiveness; this would permit comparisons across departments, systems, users and organizations (DeLone and McLean, 2003). Such a measurement would help to build a cumulative research tradition which could clarify effectiveness measures.

IS evaluation is an active and organization-dependent undertaking. Organizations need a comprehensive framework for assessment to help and guide them, in developing an IS evaluation methodology.

This study takes a method used previously in non-medical settings and applies it to the health care domain. We also aim to show how organizational factors are related to the management of IS processes.

Rationale for the study

Several studies have looked at the effects of information systems on health care organizations (Jayasuriya, 1997). Electronic health records is the single most important type of system evaluated, followed by clinical physician order entry (CPOE), clinical decision support systems (CDSS), telemedicine, radiology information systems (RIS) and picture archiving and communication systems (PACS) (Keizer and Ammenwerth, 2005). Numerous health care-specific information systems are used in a modern health care facility; their effect on both organizational performance and health care quality is important. The combined effect is also more than the sum of their individual impacts on the organization.

Before we delve more into information systems evaluation, we need to clarify the difference between IT and IS. Information Systems is a wider concept than information technology and is closely related to organizational functions and information requirements (Wilcocks and Lester, 1993; Ozkan, 2004, 2005; Ozkan and Bilgen 2003). IS are both affected by organizational practices and in return have an effect on the organization. Methods are needed to make these relationships between organizational factors (i.e. size, effectiveness, human resources, and financial health) and information systems, visible and measurable. IS projects are more likely to fail than succeed but a correlation between organizational factors and IS success, could guide decision makers in planning and implementing systems.

Objectives of the study

Our objective is to use the PRISE evaluation tool to measure the level of process maturity of hospital information systems. Although the acronym HIS is generally used for “hospital information systems” and “health information systems” interchangeably, our focus in this study is limited to “hospital information systems” and does not include other information systems used in health care settings. We use the following definition for a Hospital Information System: “Computer system designed to support the comprehensive information requirements of hospitals and medical centers, including patient, clinical, ancillary and financial management” (Shortcliffe and Cimino, 2006).

Information systems are composed of elements; some are easier to measure than others. An assessment framework that only focuses on discrete “easy to measure” elements cannot show the whole picture or provide an exclusive assessment of the success of a system (Perera et al, 2007). Central processor unit utilization time and network load are easily measured, but the usability of a new graphical user interface or the usefulness of a decision support advice might be harder to measure.

The goal of an HIS evaluation framework is to provide a set of measures and performance indicators that can be used to predict the quality of processes that ultimately result in better outcomes at either a user/patient or cost saving level (Perera et al, 2007). Development of a universal set of indicators and measures require best practice data and established validity pertaining to the individual indicators (Perera et al, 2007). This scope of evidence is only possible through many studies that provide this kind of scientific proof from numerous different systems and implementation settings. One of our goals is to provide methodology and data that contributes to this body of knowledge.

PRISE is a novel, comprehensive and innovative approach to assessing the effectiveness of IS processes; it was developed by one of the authors of this paper as part of a PhD thesis (Ozkan et al, 2007) and to help organizations evaluate their IS management with a strong process focus. The PRISE questions can be asked by an external assessor or reviewed internally for self evaluation. PRISE has 10 process areas, all of which are all related to IS. Each area includes more detailed questions which are scored on a scale that has six levels. Each score level from 0 to 5 represents a different level of maturity in IS processes.

PRISE has successfully evaluated IS process maturity in non-health care technology organizations as applied in the original PhD thesis (Ozkan, 2006; Ozkan et al, 2007). Since there is a lack of specific health IS assessment frameworks, we believe that the application of general IS assessment frameworks such as PRISE might suggest how health IS assessment methods should be developed and applied.

We hypothesize that there are correlations between PRISE scores and organizational factors within a health care organization. Identifying these correlations will guide future research in determining causal relationships between these organizational factors and IS success. Our research question is: *“Is there a relationship between certain organizational factors and PRISE scores?”*

RESEARCH METHODOLOGY

Organizational setting

The assessment was carried out in Turkish health care provider organizations with inpatient capabilities: state hospitals, private hospitals and academic medical centers (university hospitals). The Hospital Information Systems (HIS) were assessed. All of the hospitals used commercial software systems with little or no internal development of support or maintenance. We did not study any general and administrative systems (i.e. accounting information systems) nor IS any departmental confined to that department.

Study design

819 hospitals were initially contacted via e-mail. A total of 4 e-mail reminders were sent to all the target hospitals between November 2006 and April 2007. In the end, 17 institutions finally agreed to participate in our study. Each health care organization was sent an e-mail message with an attached copy of the assessment tool (see appendix) and instructions on how to use it. We asked the organizations to assign a senior IS officer to complete the self-assessment process.

PRISE evaluation tool

PRISE consists of 92 questions in 10 process groups; they are assessed on a 6 level scale (see Table 1).

Level	Explanation
0	Non existent
1	Initial /Ad Hoc
2	Repeatable but intuitive
3	Defined process
4	Managed and measurable
5	Optimized

Table 1- PRISE Scale

PRISE (Ozkan et al, 2007) was developed to provide a comprehensive and integrative information systems assessment framework. Jayasuriya et al, note that most other approaches to evaluate IS effectiveness lack an integrated approach; they may yield convenient solutions within their specific contexts, but they do not comply with all of the guidelines in the literature (Borum and Christiansen, 2006). PRISE aims to provide an integrated approach to IS evaluation by complying with the guidelines.

The PRISE model consists of three main components: People, Resources, Services and Benefits, with a total of 10 process areas within those components.

	Process code	Process Definition
People	P1	Definition of the IS organization and relationships
	P2	Education and training of users
	P3	Provision of assistance and advice to IS users
Resources	P4	IS interactions
	P5	Configuration management
	P6	Performance and capacity management
	P7	Operations management
Services and Benefits	P8	Continuous service
	P9	Change management
	P10	Monitoring services

Table 2- PRISE Process areas

Participants

10 of the participants were State hospitals, owned by the government and run by the Ministry of Health. Some of these state hospitals are third level research hospitals but most are secondary level care hospitals. The University hospitals that participated in our study are also owned by the government. Only 2 of the participating hospitals were privately owned. Table 3 shows a detailed distribution of the participants.

Hospital Type	Number
State hospital	10
University Hospital	4
Private Hospital	1
Medical Center	1
Mouth and dental health center	1
Total	17

Table 3-Hospital Type

We had participants from thirteen different provinces of a total of 81 provinces in Turkey. 13 health care providers were from provincial centers and 4 of them were from smaller towns. The number of beds ranged from 19 to 1200 with a mean of 411. The number of physicians ranged between 10 and 1390 with a mean of 276. 13 of the institutions had an internal IT or IS department independent of an outsource company. Not surprisingly, the hospitals that were located in provincial centers (urban centers) had IT/IS departments and the hospitals in small towns (rural centers) did not; 12 of the hospitals had 2 or fewer people employed in the IT/IS departments. One institution employed 31 people in IT/IS services. This large variation

in the number of IT/IS services personnel (standard deviation SD=7.9) reflects organizational differences in the approach to IT/IS management.

Our participants had a mean of 4.2 years of experience (SD=3.1) with their enterprise-wide information systems and they had been using their most recent installation for a mean of 3 years (SD=2.9). We found that 10 hospitals had not changed vendors and used only the information system currently in use. The average number of different IS used was 1.6 (SD=0.8). We found that 13 hospitals used only one enterprise-wide information system for their information processing needs.

None of the participating institutions had a model of its enterprise workflow and business processes prior to the last installation. Nor did they have any previous experience with a formal IT/IS assessment or evaluation framework such as COBIT (ISACA,2007), CMMI (SEI,2007) or ITIL (OGC,2007).

All of our participants utilized an outside company to provide IT services although some health care providers in Turkey use software developed in-house.

Application of the tool and the conduct of the study

Each self assessor was asked to report according to the above scale. The assessment form that was e-mailed to hospitals included instructions about PRISE and information about the logistics of the study; there was a link to a web site that had textual and video training about PRISE and additional questions regarding organizational factors. The respondents had to give a numerical value for each item on the scale based on the level definitions according to a pre-defined scale. Each participant was asked to fill in the assessment forms and return the results to the researchers.

There are two main reasons for choosing the self assessment method. First, PRISE is neither a legal nor an industry standard, but rather a publicly available free guideline. For a framework that is not formally endorsed the only viable dissemination method is adoption and self assessment .Second, although self assessment of IS processes is a major undertaking requiring a lot of preparation and effort, we believe this self assessment model can help organizations become aware of weaknesses in their IS processes and practices as they get some practice in IS evaluation. Since there is currently no economic or legal incentive for PRISE adoption, we believe that self assessment and improving the assessment methodology to better support this approach, is the most viable approach at the present time.

RESULTS

Table 4 shows that PRISE scores ranged between 0.4 – 3.54 (SD=0.86). The mean for all cases was 2.18 and the median was 2.11. The scores for individual process areas varied; the minimum scores for each process area ranged from 0.0-0.7 and the maximums ranged from 3.33-4.7 .

PRISEProcess ➔	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Total
Mean	2.47	2.31	2.28	1.53	2.21	2.19	2.35	2.56	1.87	2.02	2.18
Median	2.22	2.44	2.00	1.40	2.09	2.00	2.42	2.56	1.80	2.00	2.11
Std. Deviation	0.97	1.06	1.07	1.20	1.03	1.00	0.76	1.11	0.88	1.10	0.86
Minimum	0.67	0.22	0.70	0.00	0.55	0.33	0.58	0.44	0.18	0.10	0.40
Maximum	4.11	3.75	3.80	3.80	4.09	3.50	3.33	4.78	4.00	4.10	3.54

Table 4. PRISE scores

The process areas, P4 – IS interactions, and P9 – Change management received the lowest mean scores. Process areas, P1- Definition of the IS organization and relationships, and P8 – Continuous service received the highest mean scores.

13 health care providers (76.5 %) received scores of 3 or lower. Level 3 signifies a documented process and a standard way of carrying out IS related management activities. We checked whether there were any statistically significant relationships between process scores and such organizational factors as location (being in a provincial center rather than a smaller town) or

size of the target population. Mann-Whitney U tests showed significant differences in P5-Configuration management and in P8-Continuous service process areas for health care institutions with different target populations. We used Spearman’s bivariate correlation analysis to see if there were any significant correlations in these differences. Our data shows a strong positive correlation between the target population of the institution and P5-Configuration management scores with a correlation coefficient of 0.573 ($P= 0.02$).

We also explored whether the providers’ own size (number of beds and/or number of physicians) were associated with any difference in the PRISE scores. We analyzed the results with Mann-Whitney U test and found that none of the process areas showed any significant differences.

We expected to find a correlation between the number of IT staff and certain process area scores. We found that the higher the number of IT personnel, the higher an institution scored on P8-Continuous service process area; organizations which give importance to maintaining a continuous level of service must have sufficient resources to perform such tasks. The number of IT personnel was also positively correlated with the overall PRISE score (see Table 5). The overall PRISE Score was calculated by taking the mean of all 92 PRISE questions.

			P8	PRISE Score	IT personnel
Spearman's rho	P8	Correlation Coefficient	1.000	0.896(**)	0.632(**)
		Sig. (2-tailed)	.	0.000	0.006
	PRISE Score	Correlation Coefficient	0.896(**)	1.000	0.534(*)
		Sig. (2-tailed)	0.000	.	0.027
	IT personnel	Correlation Coefficient	0.632(**)	0.534(*)	1.000
		Sig. (2-tailed)	0.006	0.027	.

Table 5- Correlation between the number of IT personnel and certain PRISE scores

**** Correlation is significant at the 0.01 level (2-tailed).**

*** Correlation is significant at the 0.05 level (2-tailed).**

-- N=17

DISCUSSION

It is imperative to provide quality care while reducing soaring health care costs. To accomplish, we must know if the models we apply in other industries will also result in efficiency and effectiveness in health care information systems. The only way we can achieve this is through evidence-based health care informatics.

More research should identify factors that result in effective health care information systems. We also need to prove that IT actually reduces costs instead of being a cost center for the enterprise. Information systems assessment and health informatics evaluation are aspects of evidence-based health informatics that can provide answers to these important questions. We believe our study is a contribution and a step forward in showing that health care information systems can benefit from the IS assessment models used in other industries.

PRISE contained some questions that were not really suited to a hospital setting. Despite their many differences, all our participant hospitals had consistently higher or lower scores on certain process areas, indicating that regardless of size, location, ownership model or focus, they shared certain characteristics.

This situation is illustrated by the “P5-Configuration management process” area which contains 11 questions, some of which did not apply closely in health care settings. Although there is a certain amount of software development activity, none of our health care institutions primarily developed software; they all bought or outsourced their IT services. In this situation, contract management and service management activities become more important than management of development activities. Yet, our data showed a strong positive correlation between the target population of the institution and P5-Configuration Management area scores. We believe this is due to the fact that software development, hence configuration-management related activities were only carried out in larger hospitals that were generally located in large urban areas. Our analysis also reflect a similar relationship between IT personnel number and P5- Configuration management process area; these hospitals could afford tailored software (developed either by their own personnel or by contractors) to increase the functionality of their systems, and they reported higher level management practices in the area of configuration-management process. This

result suggests that small rural hospitals should be supported in terms of IT personnel and software development since every institution has specific information needs that can be satisfied with appropriate development.

All of the participating institutions had some form of management support and initiatives to implement better IS/IT management practices. Some hospitals were required to plan and document IS management activities for external reasons such as quality improvement and accreditation (i.e. ISO 9001 and/or JCI Accreditation); others had people at the top management level with IT/IS know-how. Both of these resulted in relatively higher scores in P1- Definition of the IS organization and relationships. We believe that these relatively higher scores did not translate into higher scores in other process areas, because of a lack of organizational culture and effective communication in terms of IT/IS management.

We found that despite their differences, all organizations share common strong and weak process areas. It is not surprising that process area “1-Definition of the IS organization and relationships” and process area “8-Continuous services” have higher scores than other process areas. All organizations were aware that good IS management and the provision of continuous service is crucial to the continuity of their business operations and a failure to maintain business continuity could result not just in catastrophic financial losses but even in the loss of patient lives.

Organizations received generally lower scores for the process areas “4-IS interactions” and “9-Change management”; given the current nature of medical services in Turkey, this result is quite normal. Hospitals operate within their own defined domains; they are not concerned about data sharing and interoperability. Process area “9-Change management and monitoring services” is another weak side of these organizations. These results may be partially due to a lack of understanding of general change management and monitoring services, which in turn, affects IS as well. Organizations did not have a clear understanding of either of these concepts; we found that most if not all the items in this section, were implemented only at a very basic level.

Probably our most important finding was the correlation between the Total PRISE score and number of IT personnel in a hospital. IT personnel number was the only organizational factor correlated with total PRISE scores; other factors were found to be correlated with scores for sub process areas. This finding indicates that the human factor is very important in IS processes’ success and that appropriate staffing of IT departments is closely related to the quality of information systems.

Although the PRISE model, is very thorough in assessing the IS processes of a general organization, we believe it can be more effectively applied in health care domain if it is modified for the specific needs and attributes of health care organizations.

Some things were not evaluated thoroughly by PRISE. These included the outsourcing model (which was very common in the IS sourcing of our participating organizations) and some other very important health-IS related issues such as privacy and confidentiality, workflow management issues and outcomes management, PRISE covers the breadth of IS assessment, but lacks specific questions or the depth necessary to effectively evaluate issues regarding clinical aspects of hospital information systems. A new model that can address such issues must be developed to improve assessment in the health care IS domain. Such a model can be a promising future research topic.

It is important to note that the findings from this research study are useful for the following IS stakeholders: (1) IS managers, (2) IS users, (3) IS developers. The evaluation of IS processes of an IS organization, i.e. in this study “hospitals”, by means of using PRISE model are primarily valuable for the managers of hospitals.

LIMITATIONS

Our study assumed that every health care organization had a functional organization-wide HIS and was capable of using a questionnaire-based self assessment tool to evaluate its own effectiveness in managing IS. We observed that both the motivation and the capability to conduct such a self assessment were less than expected resulting in a low participation rate in our study. More participation could have allowed us to generalize the results of our case study country-wide. A future project that receives financial support may be able to reach more hospitals and perform a more thorough analysis of IS management.

Application of PRISE may yield different results, if a trained assessor carries out the assessment. An increase in the number of hospitals participating in our study would produce a better statistical analysis and might show different relationships between PRISE scores and organizational characteristics. We believe that organizational effectiveness should also be measured and compared with the results of PRISE measurements. It would be very important for future research to study whether higher PRISE scores, meaning a better information system, are related to better financial and medical outcomes. We believe our study is an important attempt to objectively measure management practices related to the information systems

in the health care environment. Hopefully our findings will pave the way for improvement in health care information systems, perhaps leading to better health care.

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CONFLICT OF INTEREST

PRISE is a freely available tool. One of the authors is a faculty member at the university that governs one of the participating hospitals; however this fact had no affect on the conduct of our study, nor did it affect our reporting in any way. The authors did not receive any financial support.

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APPENDIX

Process: **P1 Definition of the IS organisation and relationships**
Component of PRISE: **People**

Questions:

1. Does the IS organisation communicate its goals and results at all levels?
2. Is the IS organised to be involved in all decision processes, respond to key organisation initiatives and focus on all corporate automation needs?
3. Is the IS organisational model aligned with the organisation functions and does it adapt rapidly to changes in the organisation environment?
4. Through encouraging and promoting the taking of responsibility, does the IS organisation develop and grow individuals and heightens collaboration?
5. Are there clear command and control processes, with segregation where needed, specialisation where required and empowerment where beneficial?
6. Does the IS organisation properly position security, internal control and quality functions, and adequately balances supervision and empowerment?
7. Is the IS organisation flexible to adapt to risk and crisis situations and moves from a hierarchical model, when all is well, to a team-based model when pressure mounts, empowering individuals in times of crisis?
8. Can a strong management control be established over the outsourcing of IS services, with a clear policy, and awareness of the total cost of outsourcing?
9. Are essential IS functions explicitly identified in the organisation model, with clearly specified roles and responsibilities?

Process: **P2 Education and training of users**
Component of PRISE: **People**

Questions:

1. Is there a comprehensive education and training program, focused on individual and corporate needs in place?
2. Are these education and training programs supported by budgets, resources, facilities and trainers?

3. Are training and education critical components of the employee career paths?
4. Do employees and managers identify and document training needs?
5. Is the needed training provided in a timely manner?
6. Is there senior management support to ensure that employees perform their duties in an ethical and secure manner?
7. Do employees receive system security practices training in protecting against harm from failures affecting availability, confidentiality and integrity?
8. Does the corporate policy require that all employees receive a basic training program covering ethical conducts, system security practices and permitted use of IS resources?
9. Is there management acceptance that training costs are investments in lowering the total costs of technology ownership?

Process: **P3 Provision of assistance and advice to IS users**

Component of PRISE: **People**

Questions:

1. Are there up-to-date and easily accessible Frequently Asked Questions (FAQs) and their answers available?
2. Do knowledgeable and customer-oriented support staff resolve problems in close co-operation with the problem management staff?
3. Are all user inquiries consistently and thoroughly registered by the help desk?
4. Are the user inquiries that cannot be resolved in a timely manner appropriately escalated?
5. Is the clearance of user inquiries monitored?
6. Are user questions resolved in a timely manner?
7. Are those user inquiries that cannot be resolved in a timely manner investigated and acted upon?
8. Does the management monitor trends to identify root causes in a proactive manner and follow up with analysis and the development of sustainable solutions?
9. Are there corporate policies and programs defined for training users in technology use and security practices?
10. Is there management awareness of the cost of support services and user downtime and of the need to take action on root-cause issues?
11. Are support costs charged back to the business using simple tools and clear policies?

Process: **P4 IS Interactions**

Component of PRISE: **Resources**

Questions:

1. Are communication with the customers done via the Internet medium ?
2. Is there an extensive use of the other information systems web pages?
3. Is there an extensive interaction with the customer via the Internet?
4. Is the use of other information systems documented?
5. Is there an extensive use of similar information systems for improvement?

Process: **P5 Configuration Management**

Component of PRISE: **Resources**

Questions:

1. Are there owners established for all configuration elements who responsible for maintaining the inventory and controlling change?
2. Is the configuration information maintained and accessible, based on up-to-date inventories and a comprehensive naming convention?
3. Is there an appropriate software library structure in place, addressing the needs of development, testing and production environments?
4. Is there a release management policy and a system to enforce it?
5. Are record keeping and physical custody duties kept segregated?
6. Is there an integration with procurement and change management processes?
7. Are vendor catalogues and configuration aligned?
8. Do configuration baselines exist, identifying the minimum standard components and integration requirements, consistency and integration criteria?
9. Is there an automatic configuration detection and checking mechanism available?
10. Is there an automatic distribution and upgrade process implemented?
11. Is there zero tolerance for illegal software?

Process: P6 Performance and capacity management**Component of PRISE: Resources**

Questions:

1. Are the performance and capacity implications of IS service requirements for all critical business processes clearly understood?
2. Are the performance requirements included in all IS development and maintenance projects?
3. Are the capacity and performance issues dealt with at all appropriate stages in the system acquisition and deployment methodology?
4. Is the technology infrastructure regularly reviewed to take advantage of cost/performance ratios and enable the acquisition of resources providing maximum performance capability at the lowest price?
5. Are skills and tools available to analyse current and forecasted capacity?
6. Is the current and projected capacity and usage information made available to users and management in an understandable and usable form?

Process: P7 Operations management**Component of PRISE: Resources**

Questions:

1. Are operations instructions well defined, according to standards, and with provision of clear cut-off and restart points?
2. Is there a high degree of standardisation of operations?
3. Is there close co-ordination with related processes, including problem and change management functions, and availability and continuity management?
4. Is there a high degree of automation of operations tasks?
5. Are operational processes re-engineered to work effectively with automated tools?
6. Is rationalisation and standardisation of systems management tools implemented?
7. Is the input and output handling, as much as possible, confined to the users?
8. Are changes to job schedules strictly controlled?
9. Are there strict acceptance procedures for new job schedules, including documentation delivered?
10. Are there preventive maintenance schemes in place?
11. Are the service support agreements with vendors defined and enforced?
12. Are there clear and concise detection, inspection and escalation procedures established?

Process: P8 Continuous Service**Component of PRISE: Services and Benefits**

Questions:

1. Is there a no-break power system installed and regularly tested?
2. Are potential availability risks proactively detected and addressed?
3. Are the critical infrastructure components identified and continuously monitored?
4. Is the continuous service provision a continuum of advance capacity planning, acquisition of high-availability components, needed redundancy, existence of tested contingency plans and the removal of single points of failure?
5. Is there a procedural action taken on the lessons learned from actual downtime incidents and test executions of contingency plans?
6. Is the availability requirements analysis performed regularly?
7. Are the agreements used to raise awareness and increase cooperation with suppliers for continuity needs?
8. Is the escalation process clearly understood and based on a classification of availability incidents?
9. Are the costs of interrupted service specified and quantified where possible, providing the motivation to develop appropriate plans and arrange for contingency facilities?

Process: P9 Change Management**Component of PRISE: Services and Benefits**

Questions:

1. Are change policies clear and known and are they rigorously and systematically implemented?
2. Is the change management strongly integrated with release management and is it an integral part of configuration management?

3. Is there a rapid and efficient planning, approval and initiation process covering identification, categorisation, impact assessment and prioritisation of changes?
4. Are there automated process tools available to support workflow definition, pro-forma workplans, approval templates, testing, configuration and distribution?
5. Are there expedient and comprehensive acceptance test procedures applied prior to making the change?
6. Is there a system for tracking and following individual changes, as well as change process parameters, in place?
7. Is there a formal process for hand-over from development to operations defined?
8. Do the changes take the impact on capacity and performance requirements into account?
9. Is there a complete and up-to-date application and configuration documentation available?
10. Is there a process in place to manage co-ordination between changes, recognising interdependencies?
11. Is there an independent process for verification of the success or failure of change implemented?
12. Is there segregation of duties between development and production?

Process: **P10 Monitoring services**
Component of PRISE: **Services and Benefits**

Questions:

1. Are there useful, accurate and timely management reports available?
2. Have the processes been defined and understood what the targets are and how to achieve them?
3. Do the measurements of IS performance include financial, operational, customer and organisational learning criteria that ensure alignment with organisation-wide goals?
4. Are there clearly understood and communicated process objectives?
5. Is there a framework established for defining and implementing IS management reporting requirements?
6. Is there a knowledge base of historical performance established?
7. Is there a consistent application of the right limited number of performance indicators?
8. Is there an increased number of process improvement opportunities detected and acted upon?
9. Is the management satisfied with performance reporting?
10. Is there reduced number of outstanding process deficiencies observed?