MODELING AND ASSESSMENT OF THE EFFECTIVENESS OF GOVERNMENT INFORMATION SYSTEMS

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ABSTRACT

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In the context of evaluating effectiveness of information systems, the public sector requires a specific approach for measuring indirect benefits such as strategic / political value. There is not yet a holistic approach and no unified adaptive and time-variant model addressing the problem. In this thesis, Strategic Management Model developed and partially applied at the Ministry of Finance, Turkey, is described. The model is based on the public value delivery chain, from strategic goals to accountability reporting. Public Financial Management Value Space is built step by step, and a method is defined on the Value Space for effectiveness assessment through calculation of five value components, namely the Agency Value, User Value, Political Value, Strategic/Social Value, and Environmental Value, using weighted summation of key goal and performance indicators. Value space is mapped to ontology, then to the object model for flexible system implementation. The assessment calculation method, resulting in a single value allows for a-posteriori benefits assessment, allows not only for cross-comparison of programs, agencies, functions, etc. by fixing the values on the dimensions of the value space under analysis, but also standardization and consolidation. Economy, efficiency and effectiveness are linked as an extension of the assessment model by introducing the expenditure component of the budget.

The model has been applied to two case studies of Information System investments at the Ministry of Finance, and a cross-comparison of these initiatives has been provided.

Keywords: Public Value, Information System Effectiveness, Public Financial Management, Strategic Management

ÖZ

KAMU BİLİŞİM SİSTEMLERİNİN ETKİLİLİĞİNİN MODELLENMESİ VE DEĞERLENDİRİLMESİ

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Bilişim sistemlerinin etkililiğinin değerlendirilmesinde, kamu sektörü, stratejik / politik değer gibi dolaylı faydaların da ölçülebildiği özel bir yaklaşım gerektirir. Henüz bu problemi adresleyen holistik bir yaklaşım ile bütünleşik, adaptif ve zaman-değişken bir model yoktur. Bu tezde, TC Maliye Bakanlığı'nda geliştirilmiş ve kısmi olarak uygulanmış Stratejik Yönetim Modeli irdelenmektedir. Model, stratejik hedeflerden hesap verebilirlik raporlamasına uzanan kamu yararı değer zinciri kullanılarak, Kamu Mali Yönetimi Değer Uzayı üzerine adım adım inşa edilmekte; bu Değer Uzayı üzerinde, Kurum, Kullanıcı, Politik, Stratejik/Sosyal ve Çevre olmak üzere beş değer kavramı temelinde bir etkililik değerlendirme metodu, ayrıca temel hedef ve performans göstergelerin ağırlıklı toplamını kullanan bir hesaplama yöntemi sunmaktadır. Değer uzayı, önce ontolojiye, daha sonra da nesne modeline yansıtılarak, esnek bir gerçekleştirim sağlanmaktadır. Önerilen hesap yöntemi, proje sonu faydaların değerlendirilmesi ile analiz kapsamındaki boyutun sabit tutularak programların, kurumların, fonksiyonların karşılaştırılması, standardizasyon ve konsolidasyon için tek bir değer sağlanmaktadır. Değerlendirme modeli, ekonomiklik, verimlilik ve etkililik kavramları bütçedeki harcama ögeleri ile ilişkilendirilerek genişletilmiştir. Model, karmaşık ve kaotik kamu mali yönetim ortamı için basitleştirme sağlamaktadır.

Model, Maliye Bakanlığı içindeki iki bilişim sistemi yatırımına vaka çalışması olarak uygulanmış, bu projeler birbiriyle kıyaslanmıştır.

Anahtar sözcükler: kamu yararı, bilişim sistemleri etkililiği, kamu mali yönetimi, stratejik yönetim

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LIST OF ACRONYMS AND ABBREVIATIONS

AHP	Analytical Hierarchy Process
CBA	Cost Benefit Analysis
CSF	Critical Success Factor
DVAM	Demand and Value Assessment Methodology
EGEP	eGovernment Economics Project
ESAS	Economic and Sectoral Analysis Service
EU	European Union
G2B	Government to Business
G2C	Government to Citizen
G2E	Government to Employee
G2G	Government to Government
GD	General Directorate
GFS	Government Finance Statistics
ICT	Information and Communication Technology
ICTBC	ICT Business Case
ICTBCG	ICT Business Case Guide
IRR	Internal Rate of Return
IS	Information System
IT	Information Technology
KGI	Key Goal Indicator
KPI	Key Performance Indicator
MIS	Management Information Systems
MoF	Ministry of Finance
NB	Net Benefits
NPV	Net Present Value
PBB	Performance Based Budgeting

PFM	Public Financial Management
PFMVS	Public Financial Management Value Space
PI	Performance Indicator
PP	Performance Program
PV	Public Value
RoI	Return on Investment
SDS	Strategy Development Service
SDU	Strategy Development Unit (SGB in Turkish)
SMM	Strategic Management Model
SP	Strategic Plan
TNKM	The New Knowledge Management
TPV	Total Public Value
VMM	Value Management Methodology
VS	Value Space
WiBe	Wirtschaftlichkeitsberechnungen (Economic Efficiency Assessments in Particular with Regard to the Use of ICT)

CHAPTER I

INTRODUCTION

It is no surprise that in a survey (ISACA, 2008), "Enterprise-based IT Management and IT Governance and IT Value Management" have been identified within the top 7 business issues. Public sector is no exception; each and every government needs to justify public spending and secure ongoing support through demonstrating value to the public. There have been various studies in different countries, as summarized by various authors (Berghout & Remenyi, 2005) (Guclu & Bilgen, 2009; 2010). Bannister (Bannister, 1999) mentions value sets and the fact that the values of efficiency and effectiveness are generally controlled by the Ministry of Finance (MoF), duty, service and social orientation of core values; and proposes a six-way framework categorisation of Information Technology (IT) value, including hard-to-measure ones such as policy and democracy. Lech (Lech, 2007) proposes a Compact IT Value Assessment Method.

The main point to emphasize is, government Information System (IS) values are different than those of the private sector, and are often subjective and hard to measure, with missing value component related with the environmental impact of government initiatives. In this research, recently developed Strategic Management Model (SMM), which has been applied at the MoF in Turkey, and later expanded to cover more than 100 other public agencies, is discussed.

Extensive literature survey, model and practical experience demonstrate that services based on process definitions have to be used to capture the drivers for more efficient, more effective, user-focused delivery of services to the public, with reduced bureaucracy, through streamlined value delivery processes.

Based on this model, an effectiveness assessment model for the government IS is presented as a weighted summation of five value components, namely the Agency Value, User Value, Political Value, Strategic/Social Value, and Environmental Value, with hierarchical breakdown into key goal and performance indicators, merging the concepts from IS and public finance domains. This extendible model allows for continuous monitoring and evaluation of the programs underway for internal control purposes of the agency and for external audit, rather than providing a one-time assessment. The same model can be used not only for IS effectiveness, but also for assessing the effectiveness of any well-defined program or project. This model can be used as a tool for impact analysis of the policy decisions.

1.1. IT Investments

On April 06, 2009, European Information Technology Observatory announced (EITO, 2009) that the market for fixed-net Internet access in the EU is forecast to grow in 2009 by 8.4% to a new record value of €37.9 billion. "Business with Internet connections is booming", said EITO chairman Bruno Lamborghini: the downturn in the economy would make no difference to this.

The Gershon Review in the UK identified a potential of efficiency gains in the public sector of about 30 billion euros by 2008 (Gershon, 2004). These gains produce resources that can be released for and contribute to socio-economic growth. Increasing the efficiency and effectiveness of how the public sector manages the economy and society can substantially reduce the administrative burden it imposes on businesses and citizens (OECD, 2007). But…the cost to the taxpayer of abandoned Whitehall computer projects since 2000 has reached almost £2bn (Hahamis, 2005). The price of failure is high. Schware of World Bank had quoted about 85 percent failure rate of projects in developing countries (Schware,

2004). This finding is confirmed by a more recent Standish Group report, CHAOS Summary 2009 (Crear, 2009).

Former UK prime minister Tony Blair argued that "I get an increasingly individualised and customised service from many providers – how can I get that individual approach from the public services?" (NSG, 2007). He emphasises the empowerment of the user, greater diversity of supply, personalisation in public services, and qualified workforce itself as the four principles of public service reform. Similarly, Gordon Brown, states that "… over the last ten years the Government has doubled investment in our public services." (NSG, 2007)

According to a revised forecast from IDC, towards the end of 2008 (IDC, 2008), IT spending was still expected to increase by 2.6% in 2009, down from the previous forecast of 5.9% growth, despite the global economic crisis in 2008. This is probably due to the fact that technology has already become an integral part of our operations, and will remain so. IDC expects IT spending to reach growth rate of 6.0% in 2012. This is in line with Forrester Research findings (Forrester Research, 2009), which is quoted to estimate a decline by 3% to $1.66 trillion USD in 2009, as in 2008 there was an 8% increase from 2007. This will be the first time global IT spending will decline since 2002. Hardware will be hit the worst, and there will still be a 2% increase in software investments, due to expectations in productivity and efficiency gains. Yet 15% - 20% level decline seen in 2001 crisis is not expected. Gartner's predictions are no different (Gartner, 2008), even the worst case scenario envisages an increase in spending, though not at the levels estimated before the crisis (Channel Register, 2008), IT spending will still be in the order of $3.5 trillion in 2009, a modest grow of 3.9%. According to Gartner, technology spending will increase 0.5% in North America, will drop 0.8% in Western Europe, and will increase 8.3% in Asia Pacific.

It is expected that not only businesses, but also the governments will have to be more and more accountable for every dollar spent on IT. The 2008-2009 crisis has not diminished the need for assessment of IS investments, but rather increased it. Governments will still evaluate the value from IT in terms of the citizen, operational efficiency and political return (Gartner, 2003) Enterprise IT

Management, IT governance and IT value management will still be the key business issues (ISACA, 2008), as investing in Information and Communication Technology (ICT) can consume enormous resources, proportional to the size of the organization.

There are various reports by the World Economic Forum (Dutta & Mia, 2009), the Economist Intelligence Unit (EIU, 2007), Cap Gemini study for the EC (Cap Gemini, 2007), and the surveys of the United Nations (UN, 2008) to assess country-level e-readiness. These reports provide us with a clear capture of the drivers for more efficient, more effective, user-focused delivery of services to the public, with less bureaucracy, in a streamlined manner. Close investigation of the rankings, compared with the Corruption Perception Index (TI, 2008) of Transparency International, seems to suggest that there is close link between the information accessibility, e-inclusion, e-service delivery and transparency (Guclu, 2008).

According to JCN Newswires, global ICT spending Tops $3.5 Trillion; 'Digital Planet 2008' Study Released by WITSA on the First Day of WCIT 2008 (Goliath, 2008).

Similarly, an SAP study (SAP, 2008) captures that corporate IT spending continues to grow. Since 1994, the IT spending per worker has more than doubled, from US$3,500 to US$8,000 per worker. Annual productivity growth in U.S. companies roughly doubled in the same period, after experiencing 1.4% growth for 20 years.

Gartner expects to see worldwide IT spending grow 5.1 per cent in 2011 (Dutt, 2011), making technology a 3.6 trillion USD market. In 2010, IT spending totalled 3.4 trillion USD, up 5.4 per cent compared to 2009.

In the 1990s, projects were measured on time and on budget. In today's business environment, executives and shareholders care about the value of investments. On time, on budget, and on value are the measures of success for an IT investment and project.

Schware, once the task manager of the MoNE projects in Turkey, stated that about 85 percent failure rate of projects in developing countries. Of those, 35 percent failed completely. Only 15 percent can be fully seen as successful. The statistics in

the United States and Europe are just as grim. He also stated that in some countries, politicians speed up e-governance projects just before elections to win votes, but end up harming the projects (Schware, 2004).

Gartner Group, in an EU specific report (Lau, 2007) captures that as time passes and scrutiny of public spending grows, pressure is increasing on the public sector Europe-wide, and more particularly in the UK, to justify the sums of taxpayers' money invested in technology and to prove that this is money well spent. According to Gartner, however, Governments are not accurately measuring and demonstrating the Public Value (PV) of IT, because they are too focused on simply evaluating the financial benefits of that investment rather than its wider social impacts. For example, while it is easy to calculate Return on Investment (RoI) on projects such as e-procurement systems, there can be wider and often detrimental repercussions: an authority that starts to buy through a central e-procurement marketplace often stops to procure goods and services locally, which can have a negative impact on local economic development. By still relying on commercial benchmarks of RoI - such as payback period, Net Present Value (NPV), Internal Rate of Return (IRR) and economic value - to evaluate the success of their IT investments, government fail to accurately measure the full value of their IT investments. These RoI measurement methods indeed overlook technology benefits that bridge social exclusion, increase access to public services, create new markets, generate employment and investment, improve technology development and raise levels of education. As a result, more than 50% of government IT initiatives that have been cost-justified by traditional economic and financial return methods will fail to achieve their RoI targets.

It is no surprise that in a 2008 survey by ISACA (ISACA, 2008), "Enterprise-based IT Management and IT Governance" and "IT Value Management" are within the top 7 business issues.

Investing in ICT can consume enormous resources, proportional to the size of the organization. "ICT is often the largest category of expenditure after staffing costs, and it can be a difficult task to acquire a clear and complete picture of exactly how much is being spent, on what types of technology assets and processes, and where

in the enterprise. In far too many cases, IT costs are not understood and budgets are spread across business units and functions with no overall oversight" (ITGI, 2008).

The greatest portion of ICT spending is typically on post-implementation maintenance and operational costs, draining funds for technologies to support more strategic initiatives. Consequently, funds are almost wasted on ICT, as many projects "fail to demonstrate concrete, measurable business value for the investment". ITGI captures that "enterprises with the most effective IT governance achieve 40 percent better returns from their IT investments."

The ICT investment can be measured in

1. Direct measurement: Money, NPV (Gardner, 2000), RoI, etc.
2. Indirect measurement: preventing negative return, keeping up with a competitor, avoiding loss in market share.

It is indirect measurement that is hard to measure. Especially in government technology systems, the value structure (BAH, 2003) (AGIMO, 2004) is comprised of five value factors:

1. Direct User (Customer) Value. Benefits directly realized by users or multiple user groups. Users or customers will vary based on the type of initiative being assessed. Users may include, but are not limited to, government employees, other government organizations, and citizens.
2. Social (Non-Direct User/Public) Value. Benefits not related to direct users (e.g., society as a whole).
3. Government Operational / Foundational Value. Order of magnitude improvements realized in current government operations and processes and in laying the groundwork for future initiatives.
4. Government Financial Value. Financial benefit (e.g., cost savings, cost avoidance) realized by the government, including financial benefits received by the managing or sponsor agency as well as other public sector agencies.
5. Strategic / Political Value. Benefits that move an organization closer to achieving its strategic goals, the priorities established by the executive

office of the president/prime minister, and congressional/parliamentary mandates.

1.2. Impact of IT on the Society

Looking at the problems from the Turkish perspective, The Global Information Technology Report 2008–2009 by the World Economic Forum (Dutta & Mia, 2009), Turkey ranks 61 amongst 134 countries, with a score of 3.91 / 6.00. The scoring framework is based on a total of 9 pillars and 68 variables, as follows:

1. Environment subindex: market environment, political and regulatory environment, infrastructure environment
2. Readiness subindex: individual readiness, business readiness, government readiness
3. Usage subindex: individual usage, business usage, government usage

The report states that Turkey drops six places from 2007, positioning itself at 61st, with a fairly homogeneous showing across the different pillars composing the NRI. While the environment appears to be quite ICT friendly (56th), especially in its regulatory dimensions (56th), significant room for improvement remains in the readiness subindex (69th), in particular with respect to ICT accessibility, the quality of education, and the government's vision and e-leadership in ICT diffusion, among others. In particular, Turkey's government readiness, at 87th, receives the lowest mark across the nine pillars.

Data associated with the Networked Readiness Index is as follows:

Table 1. Networked Readiness Index for Turkey

Edition (number of economies)	**Rank**	**Score**
2008–2009 (134)	61	
2007–2008 (127)	55	
2006–2007 (122)	52	
Global Competitiveness Index 2008–2009 (134)	63	
Internet users per 100 population, 2006	17.7	
Internet bandwidth (mB/s) per 10,000 population, 2007	12.1	
Mobile telephone subscribers per 100 population, 2007	82.8	
1.03 Availability of latest technologies	45	5.13
1.06 High-tech exports, 2006	93	0.28
1.07 Burden of government regulation	104	2.74
1.13 Freedom of the press	106	4.31
1.14 Accessibility of digital content	42	5.13
2.02 Laws relating to ICT	55	4.03
2.04 Intellectual property protection	93	3.05
3.01 Number of telephone lines per 100 population, 2007	55	24.59
3.02 Secure Internet servers per million population, 2007	50	38.14
3.03 Electricity production KWh per capita, 2005	72	2,247.36
3.04 Availability of scientists and engineers	59	4.34
3.05 Quality of scientific research institutions	52	4.12
3.06 Tertiary enrolment, 2006	60	34.62
3.07 Education expenditure as percentage of GNI, 2006	90	3.49
4.02 Quality of the educational system	77	3.37
4.03 Internet access in schools	55	3.67
4.04 Buyer sophistication	78	3.48
4.07 High-speed monthly broadband subscription charge (US$) as a percentage of monthly GDP per capita, 2006	74	43.75
4.08 Lowest cost of broadband (US$) per 100 kb/s as a percentage of monthly GNI, 2006	68	2.51
5.01 Extent of staff training	90	3.60
5.04 Company spending on R&D	73	2.97
5.05 University-industry research collaboration	57	3.38
5.10 Computer, comm., and other services imports as percentage of total commercial services imports, 2006	94	17.01
6.01 Government prioritization of ICT	101	4.25
6.02 Government procurement of advanced tech products	106	3.06

Table 1 (continued)

Edition (number of economies)	Rank	Score
6.03 Importance of ICT to government vision of the future	85	3.88
6.04 E-Government Readiness Index, 2008 The E-Government Readiness Index assesses e-government readiness based on website assessment, telecommunications infrastructure, and human resource endowment	70	0.483
7.01 Mobile telephone subscribers per 100 population	62	82.77
7.02 Personal computers per 100 population	78	5.93
7.03 Broadband Internet subscribers per 100 population	46	5.80
7.04 Internet users per 100 population, 2006	74	17.73
7.05 Internet bandwidth (MB/s) per 10,000 population	38	12.09
8.05 Extent of business Internet use	46	4.50
9.01 Government success in ICT promotion	84	4.05
9.02 Availability of government online services	50	4.11
9.03 ICT use and government efficiency	45	4.67
9.04 Presence of ICT in government offices	66	4.33
9.05 E-Participation Index The E-Participation Index assesses the quality, relevance, usefulness, and willingness of government websites for providing online information and participatory tools and services to the people	70	0.14

This is in line with the findings of the 2007 e-readiness rankings, by the Economist Intelligence Unit (EIU, 2007), which is based on a weighted collection of nearly 100 quantitative and qualitative criteria, organised into six distinct categories measuring the various components of a country's social, political, economic and of course technological development. The underlying principle behind the rankings is that digital business is at its heart business, and that for digital transactions to be widely adopted and efficient they have to thrive in a holistically supportive environment. E-readiness derives from more than just the number of computers, broadband connections and mobile phones in the country; also critical are citizens' ability to utilise technology skilfully, the transparency of the business and legal systems, and the extent to which governments encourage the use of digital

technologies. This study positions Turkey as the 42nd (of 69) with a score of 5.61 / 10.00; a slight improvement from 2006 (rank 45, score 4.77).

Similarly the Cap Gemini study for the European Commission, Directorate General for Information Society and Media (Cap Gemini, 2007) states that Turkey has achieved a solid base-line result with 50% of public services fully available online; only 8% points below the EU27+ average. Online sophistication of public services in Turkey scores 68%, this is only 7% point below the EU27+ average of 75%. The sophistication of online services for businesses is above the EU27+ average. Concerning user centricity, Turkey scores with 12% below the EU27+ average of 19%.

Finally, according to the e-Government Survey 2008 of the United Nations (UN, 2008), Turkey scores 0.4834 in 2008 as opposed to 0.4960 in 2005, with a drop of ranking from 60 to 76. The regional average is 0.4857 and the world average is 0.4514. Hence Turkey is seen to be around the average. UN also provides for the following data for Turkey:

Table 2. United Nations eGovernment Index for Turkey

Web Measure Index	0.4214
Infrastructure Index	0.2191
Human Capital Index	0.8116
E-Government Readiness Index	0.4834
Internet Index	0.186
PC Index	0.061
Cellular Index	0.467
Main Telephone Lines Index	0.263
Broadband Index	0.118
Infrastructure Index	0.2191
Internet Per 100 Users	16.56

Table 2 (continued)

PC Per 100 Users	5.56
Cellular Subscribers Per 100 Users	71.00
Main Telephone Lines Per 100 Users	25.39
Broadband Per 100 Users	3.74
eParticipation Index	0.1364
Rank	78
Per cent Utilization – Emerging Level	63%
Per cent Utilization – Enhanced Level	59%
Per cent Utilization – Interactive Level	37%
Per cent Utilization – Transactional Level	17%
Per cent Utilization – Connected Level	26%
Per cent Utilization – Total	38%

The report captures the drivers for information and data sharing (in OECD Countries) as follows:

1. Public sector business processes can be made more efficient and streamlined.
2. Public sector service delivery can be made more effective.
3. Public sector service delivery can be made more user-focused.
4. Public sector can develop and implement better decisions and policies.
5. Public sector can reduce administrative burden on citizens and businesses.
6. The quality of information and data in the public sector can be increased.
7. Citizens and businesses should only need to deliver information and data once to the public sector.

8. Citizens and businesses demand seamless services without regard to how the public sector has divided its tasks and responsibilities.

Transparency International (TI, 2008) states that no notable changes in legislation for greater transparency or satisfying reforms furthering the fight against corruption can be noted in the past two years in Turkey. Corruption Perception Index score for Turkey raised from 4.1 in 2007 to 4.6 in 2008 (rank 58th).

A careful study of readiness index closely matches the corruption perception, which suggests that there seems to be a close link between the information accessibility, e-inclusion, e-service delivery and transparency (Guclu, 2008).

1.3. Thesis Objective

Extensive literature survey shows that despite all research and country or domain based assessment methods, there is yet no holistic approach on assessing the value and effectiveness of ICT.

ICT should be considered as a part of the overall IS and assessment should not be limited to economic returns, especially in public sector. Government IS values are different than those of the private sector, and are often subjective and hard to measure, with missing value component related with the environmental impact of government initiatives.

It is essential to develop a unified adaptive and time-variant model for the assessment of the effectiveness of ICT, taking into account both tangible and intangible value propositions. This is particularly applicable to the public sector as the value in public investments drain more public resources provided through citizens' time for integration of value delivery processes and are hard to calculate in currency.

Effectiveness has to be linked with PV, through public expenditure both from goals identified in the Strategic Plan (SP) to the budgeting, and from expenditure back to the fulfilment of the stated goals and targets.

This research discusses the SMM, which has been applied at the MoF in Turkey, and later expanded to cover more than 100 other public agencies. Extensive

literature survey, model and practical experience demonstrate that services based on process definitions have to be used to capture the drivers for more efficient, more effective, user-focused delivery of services to the public, with reduced bureaucracy, through streamlined value delivery processes.

Based on this model, an effectiveness assessment model is presented for the government IS, as a weighted summation of five value components, namely the Agency Value, User Value, Political Value, Strategic/Social Value, and Environmental Value, with hierarchical breakdown into key goal and performance indicators, merging the concepts from IS and public finance domains. This highly extendible model allows for continuous monitoring and evaluation of the programs underway for internal control purposes of the agency and for external audit, rather than providing a one-time assessment. The same model can be used not only for IS effectiveness, but also for assessing the effectiveness of any well-defined program or project. This model can be used as a tool for impact analysis of the policy decisions.

1.4. Thesis Scope

This study argues that assessment of IS effectiveness, particularly in government, still remains not well developed, mainly due to the realization of non-tangible benefits. All net benefits (DeLone and McLean, 2003) can be merged into the concept of PV, which is a combination of Agency Value, User Value, Political Value, Strategic/Social Value, and Environmental Value, with hierarchical breakdown into key goal and performance indicators, merging the concepts from IS and public finance domains.

The model assumes that a SP has already been developed and hence the objectives/goals, based on higher level policy papers, are identified together with Key Goal Indicators (KGI) and Key Performance Indicators (KPI). However, the current model does not provide facilities to prioritize any one of these values and/or the goals associated with them. Hence, the model assumes that the goals associated with all of these values, including the political value, have already been identified,

prioritized, accepted by the agency management and are in line with higher level government objectives.

The model does not calculate the PV if the outcomes are not defined prior to the assessment, hence if the environmental impact is neglected in the plan, no value will be calculated in this version of the model.

It is not attempted to validate the SP itself, or to provide a model to be used for the selection, funding and setting budget ceilings of initiatives (programs, projects) proposed for.

Currently the model does not include a unified approach for associating risk directly in the formulation, which needs to be carefully considered, although there is a provision for it.

A formative method for weights management has not been included in the model other than the budget load and Analytical Hierarchical Process (AHP). This also depends on the maturity level of the agencies.

Although the model includes Environmental Value, it is not handled within the scope of this research, and it is assumed that this value only appears if specific objectives and initiatives are defined in the SP.

More importantly, the model does not assess impact, but effectiveness. Although not specified in the SP, the values might be in conflict, an initiative yielding to a maximum value in one category may yield to a negative impact value on another category. Political, User and Environmental Values will often appear to be in conflict. This approach will eventually tell us how much damage can be tolerated in one value (such as environment) while other values might have positive indicators (such as building a dam for energy and job creation). An extension should be considered to include the values associated with unspecified value categories (in the SP) such as the environment.

The model has been extended with economy and efficiency assessment in addition to and combination with effectiveness.

Empirical evidence is provided through the publicly available documents of the MoF, and many years of theoretical and practical studies at the MoF, and the model

has been applied to two IS initiatives at the MoF with relevant comparison, including cost of achievements.

In summary, this research provides a re-examination of the assessment problem of government IS based on (i) existing assessment models in literature, and (ii) existing country models; resulting in (i) a comprehensive and implementable assessment model based on the PV concept, which defines a streamlined process starting with strategic planning and value categories in Public Financial Management (PFM) value space (VS), linking goals and objectives with effectiveness, economy and efficiency, (ii) insight into future expansion of the model, and (iii) results of empirical studies in the PFM domain which provides for cross comparison of initiatives and agencies through well-defined step-by-step implementation guide.

The fundamental contribution of this research to the IS body of knowledge is a comprehensive continuous effectiveness assessment method that can be applied for government agencies' initiatives. Future research is recommended to substantiate and improve on the findings of the current study.

1.5. Thesis Outline

This thesis starts with introduction to set the background of the research.

In Chapter 2, an extensive survey of the literature on effectiveness assessment is presented for effectiveness assessment. Country specific models, approaches related with the public value concept, domain specific approaches, scorecards, and indicators are discussed. The literature is categorized and interpreted for commonalities.

In Chapter 3, the ongoing problem of IS effectiveness assessment with respect to government IS is investigated, process-based public value approach is discussed, and expected results are presented.

Chapter 4 details the Strategic Management Model, including step-by-step construction of Public Financial Management Value Space, mapping into Ontology and then to Object Model. The assessment model based on the value space is

presented and calculation method is given. Two extensions to the model, namely the linkage with the budget, enabling consideration of economy and efficiency together with effectiveness, and continuous (on-demand) assessment approach are discussed.

Chapter 5 is dedicated to two case studies within the Ministry of Finance. These case studies are compared with each other and validity and generalizability of the results and findings are discussed.

Finally, in Chapter 6, contribution of this research is summarized, both in theoretical and practical terms, limitations are discussed and a direction for future work is provided.

CHAPTER II

LITERATURE REVIEW

2.1. Effectiveness Assessment Efforts, Theoretical Framework

The measurement of value, performance, success and impact (DeLone & McLean, 1992; 2002; 2003) (Gable, et al. 2008), including human capital (Andriessen, 2003) (Sullivan, 2005) (Sullivan & McLean, 2007) (Sveiby, 2001-2010), is an ongoing effort.

As the DeLone and McLean (D&M) IS Success model (DeLone & McLean, 1992) sets the scene for the measurement of IS Success, it is no surprise that it has been widely discussed, applied to case studies, and criticized. D&M model classified existing success measures into six constructs with a causal relationship; System Quality/Information Quality, Use/User Satisfaction, Individual Impact, and Organization Impact. They used the Systems Quality to measure technical success, Information Quality to measure semantic success, and Use, User Satisfaction, Individual Impact, and Organizational Impact to measure effectiveness.

A major criticism to D&M model is from Seddon (Seddon, 1997) on (i) the combination of process and variance models being confusing as they represent different concepts, and (ii) the ambiguous Use construct not being appropriate for causal relationship explanations. Seddon (Seddon et al. 1999) goes ahead, and with the assistance of literature work, develops IS Effectiveness Matrix Framework, in which the columns represent the type of system studied, and the rows capture the stakeholders, with cell entities being the interests in the system.

An important stakeholder is seen as a country (to use Seddon's term "*society's betteroffness*"), not limiting the measurement to individuals and mostly the private sector organizations as before.

DeLone and McLean, ten years after their classical publication of 1992, present a revised model (DeLone & McLean, 2003), introducing Information Quality and Intention to Use constructs, and combining Individual and Organization Impact into Net Benefits (NBs); as Information Quality/System Quality/Service Quality, Intention to Use/Use/User Satisfaction, and NB relationships. Especially with the advancement of technology, and introduction of web based systems, the interaction patterns have changed between the users and the information systems. They argue that, as IS success is a multidimensional and interdependent construct, additional measures including societal impacts could be introduced, however, rather than complicating the model with more success measures, they prefer to group all impacts under NB category (DeLone & McLean, 2003). NB capture the balance of positive and negative impacts, and must be determined by context and objectives for each IS investment. They apply the revised model to e-commerce success, with NB comprising cost savings, expanded markets, incremental additional sales, reduced search costs, and time savings, proving multidimensional and interdependent nature of IS success.

In a later study, Petter, DeLone & Mclean (Petter et al., 2008) focus again on dimensions, measures, and interrelationships. They note that "*the impacts of IT are often indirect and influenced by human, organizational, and environmental factors*". The authors provide further clarification on Use construct, and the measures for the defined constructs. They associate NB with individuals, groups, organizations, industries, and nations, based on "*the extent to which IS are contributing to the success*" of these stakeholders. According to them, despite there have been many studies, only a few take into account multiple dimensions, resulting in consistency, generalization and reliability problems, especially when User Satisfaction is used as the primary (subjective) measure. Starting with the validated measures for IS success (Sedera et al., 2004) as System Quality, Information Quality, Individual Impact, and Organizational Impact, they capture

moderate to strong support between System Quality and NB, mixed support between System Quality, Use and NB as expected, and insufficient data for other links (Petter et al,. 2008).

Revised D&M model has later been used for e-Government projects appraisal (Hu et al., 2007) as E-Government System Quality/Information and Service Quality, Perceived Utility of Civil Servants, Enterprises and Citizens/Satisfaction of Civil Servants, Enterprises and Citizens, Impact on Civil Servants, Enterprises and Citizens, and Impact on Government relationships. The World Bank (Bhatnagar, 2007) uses D&M revised model with key dimensions of impact categorized as impact on clients (economic, governance, quality of service), impact on agencies (economic, governance, performance on key noneconomic objectives, process improvements), and impact on society (economic, governance, development goals), in two cases for Chile and India.

Two studies (Özkan et.al., 2007; 2008) have focused on different case studies, one military and others from the public and private sectors in Turkey, are based on process based evaluation. The conceptual model used for effectiveness assessment consists of the People, Resources, Benefits and Services components, with "demand", "are used in", and "in service of" relations, via the processes identified. The authors argue that Systems Quality and Information Quality are demanded by the People, and User Satisfaction requires more effective Resources. They also apply a maturity model, with levels 0-5, to assess the effectiveness in three organizations in Turkey. The limitations such as geography, diversity of organizations, and responders not representing the entire organization, limits the generality of the findings, which could have been completed by COBIT (ISACA, 2000-2009), and tracing the impact back to the objectives of the organization, with PV focusing on the external value delivery process. An approach that entails separate assessment of processes with no attempt for aggregation limits the comparability of these studies.

Tokdemir (Tokdemir, 2009) tries to overcome these limitations including justification of IS expenditure by examining its contribution to achieving organizational goals, though limited to the private sector. Her study provides a

more comprehensive study and develops a formulation, supporting what needs to be done, providing valuable guidance, using CSFs while calculating the success value. She proposes to separate legacy vs. web based systems, and applies the calculation limited to web based systems. No value is seen in such a separation as there is already a unification of web based and legacy systems within single solution framework, including a hybrid of host based central systems served through Internet in major government agencies and big financial institutions. Moreover, IS success / impact should be assessable regardless of the type of IS.

Despite all these studies in the last two decades, Irani and Love (Irani & Love, 2008) still emphasize the need for developing an evaluation framework which is balanced, generic and detailed at the same time. They also emphasize the importance of ex-post evaluation to compare planned with actual achievements, and to provide for a feedback allowing better management of resources, including IT investments. Seddon (Irani & Love, 2008, Chapter 3), while discussing the characteristics of effective IT evaluation practice, ironically emphasizes "*some level of formality (not too much)*", in addition to simple and flexible processes, strategy-business-IT alignment, and accountability. The key findings of these approaches are all used in the SMM.

A recent model to measure IS success or impact is the IS-Impact measurement model has been introduced in (Gable et al., 2008). That model defines IS success as a formative, multidimensional index, *"a measure at a point in time, of the stream of net benefits from the IS, to date and anticipated, as perceived by all key-user groups*". It consists of four constructs: Individual Impact and Organizational Impact, the impact half measuring benefits to date; and Information Quality and System Quality, the quality half as an attempt to predict future impacts. It is argued that, based on extensive qualitative analysis, they are formative constructs, i.e. complete, mutually exclusive and necessary. A common index can be used as benchmarking tool for comparison of results across time, stakeholders, different systems and system contexts. Although IS-Impact model is based on D&M model; it provides a measurement model rather than a causal/process model of success; and omits the Use construct, seeing it as a consequence of success rather than a separate

dimension. IS-Impact is an aggregate of the Impact constructs from one cycle, and the Quality constructs from the subsequent cycle. Furthermore, Service Quality is removed, arguing that it is used for the analysis of the IT function, and hence is seen inappropriate for the analysis of the IS. Moreover, additional measures are added to reflect the IS context and organizational characteristics. There are 27 quantitative measures, and a 7 point Likert-scale is used. Validation research studies on IS-Impact are still going on with particular application to public sector in various country setting (Bhatnagar et al., 2007) (Elias & Cao, 2009), as the original model was limited to Australian agencies using packaged enterprise resource management IS. The measures related with societal impact are limited to "*OI5 Improved outcomes/outputs*" and "*OI7 e-Government/e-Business*" (Gable et al., 2008) which can provide implicit information as there is no clear separation between outputs and outcomes, and "*better e-Government*" cannot be readily validated. Impact assessment sees groups such as shareholders as indirect beneficiaries, and hence key users do not include these groups, however, especially in the case of PV, the real value created not directly, but indirectly to the society at large. Moreover, IS-Impact lacks the measure associated with the proximity to the planned goals and objectives to deliver the PV.

As the huge investments by governments on providing online services through e-Government projects are being questioned, the role of IS in delivering value to public is becoming more important. Recent United Nations (UN) surveys on e-Government (UN, 2008; 2010) are based on comprehensive assessment of national online services, telecommunication infrastructure and human capital with individual indices and a unified index called the UN e-government development index as a weighted average of these indices. The 5th stage of transformation is the connected government, referring to connections among government agencies, between central and government agencies, between governments and citizens, and among stakeholders (government, private sector, academic institutions, NGOs and civil society). UN utilizes 11 capacity indicators including intangibles, 3 usage indicators, and 4 transformation indicators in citizen-centric approach to assessment of online services. As "*e-government offers financial transparency and the improvement of citizens' capabilities in risk assessment and risk control – these are*

the twin keys to promoting market confidence and public trust" (UN, 2010), there is specific emphasis on financial controls.

In recent publications, Scott and DeLone (Scott et al., 2009; Scott & DeLone, 2010) have associated public (citizen's) value with NBs in the revised D&M model with preliminary findings on measuring eGovernment success. Based on a literature survey, they state that IS success models have been applied primarily for private sector, and not much has been done identifying measures that determine e-Government success. They argue for balancing efficiency and effectiveness measures for the evaluation of e-Government NBs. They identify measures as cost, time, and communication, avoiding personal interaction, control, convenience, personalization, ease of information retrieval, trust, well-informedness, and participation in decision-making for more efficient services, more effective services and improved democracy. Although the linking the NB with PV is what in the SMM, the proposed measures, and what they measure, are still questionable, subjective and have to be validated. They also postulate that use of government IS by citizens is "*entirely voluntary*" and "*online information dissemination is the primary function of e-government*", which cannot be agreed based on practical experience in developing countries. Despite the introduction of NB, the problem associated with Use/Intention to Use has not been resolved as government IS usage in general is mandatory. Even IS intended as services for the private sector and citizens may have to be used due to bureaucratic nature. Additionally, legislation may impose to use manual IS, especially in developing countries where paper-based solutions co-exist with the computerized ones, such as the usage of physically signed official documents; decreasing the validity of IS effectiveness assessment.

2.2. Country Specific Practical Models

Literature study shows that several countries have implemented standardized procedures for evaluation of projects, mostly before they are funded (ex-ante). The PV of IT can be built on a number of value pillars of constituent service level, operational efficiency, and political return.

There have been various studies in different countries, by Department of the Premier and Cabinet Government Office of e-Government (OEG, 2008b) in Western Australia; health and education sectors (Wagner et al., 2005) (UNESCO, 2003) in various countries including Central America, Chile, China, Columbia, Costa Rica, India, Kenya, Morocco, Namibia, Senegal, Singapore, South Africa, Thailand and comparatively United Kingdom; Accredit UK (European Regional Development Fund, 2008), National School of Government, Sunningdale Institute, in UK (Neely & Delbridge, 2007); in Malaysia (Ramlan et al., 2007), Egypt (Kamel et al., 2009); in EU (Ticher & Eaves, 2004); Cabinet Office (Cabinet Office, 2005), Treasury and National Audit Office (HM Treasury, 2003) (HM Treasury, 2008a) in UK; in South Africa (Esselaar et al., 2002); in OECD (Lau, 2007); in India (OCAGI, 2002).

Several countries have standardized on assessment and evaluation of projects. A good resource is provided by Gartner (Di Maio, 2007), defining the PV of IT to be built on three pillars, namely constituent service level, operational efficiency, and political return; and comparing Value Management Methodology (VMM) of USA (Rachlin & Marshall, 2002a 2002b) (Drumm, 2003) (BAH, 2003), WiBe (Wirtschaftlichkeitsberechnungen) (WiBe, 2010) of Germany, Mareva (ADELE & Bearing Point, 2003-2005) of France, eGovernment Economics Project (EGEP) (EGEP, 2005-2008) of the European Union, Federal Enterprise Architecture Performance Reference Model (OMB, 2007) of USA, and ICT Business Case (ICTBC), previously Demand and Value Assessment Methodology (DVAM), of Australia (AGIMO, 2004; 2008) on various framework criteria. There are also the Danish ‘eGovernment signposts’ methodology (Nielsen, 2005) and Accenture’s Public Sector Value Model (Milack & Rettie, 2006), and Cap Gemini / EU Performance Framework (Cap Gemini, 2003). Canada uses outcome management - activities for the planning, managing, and realizing the desired outcomes from initiatives. Norway ensures benefits through Cost Benefit Analysis (CBA), standard indicators and post project evaluation. CTG, Albany tries to redefine the RoI for the government of the USA IT investments (Cresswell et al., 2006). Through Public RoI Value Propositions, CTG defines six kinds of impacts government IT can have

on the interests of public stakeholders: financial, political, social, strategic, ideological and stewardship.

There have also been associated critical success factors and performance indicators (AGIMO, 2006), (Stowers, 2004) (Breul et al., 2007), specifically linking budget execution and performance (Breul & Moravitz, 2006) (APQC, 2008) (Lau, 2007) (OeG, 2009b) (Rico, 2006) (OIG, 2009), for identifying benefits both to government and to users.

It is believed that with proper application of maturity level approach and related weighted assessment metrics, measurement consistency and flexibility can be improved. The following level of hierarchy for measurement can be used: Goal Indicator > Performance Indicator > Performance Metric, linking policy objectives to daily tasks.

Performance audits by Accounting Offices of UK (NAO), USA (GAO) and Australia (ANAO) assist in guidance (ANAO, 2004; 2008; 2009) (Applegate & Wills, 1999) (Nicho & Cusack, 2007) together with IT Governance (ISO/IEC, 2008) related approaches (ISACA, 2009a); COBIT (ISACA, 2000-2009), ValIT (ISACA, 2009b) and RiskIT (ITGI, 2009a). Turkish Court of Accounts have performed as little as 10 performance audits so far (Turkish Court of Accounts, 2002-2006) only 3 related to eGovernment in 2006.

Office of the Public Service Commissioner of the Queensland Government (Australia) (PSC, 2007) evaluates that "the cost of service delivery continues to rise, especially in area of human services delivery, particularly health and education, at a time when governments are operating in a constrained budgetary environment. Government's roles and responsibilities in maintaining social fabric and advancing social justice have also expanded as part of an ongoing drive to provide services which will improve the quality of life for all. There is a real need to identify means of improving effectiveness and efficiencies while maintaining service levels to the public." The important proposition is that the e-government service issues relate directly to policy, strategy, planning, organisation development and the business of government, and service delivery is not only about ICT; and that services are to be provided to benefit clients and that the systems, processes

and practices which support those services should focus on users' needs rather than agencies' service priorities.

Services should adhere to the following principles:

- co-ordinated and collaborative – achieving agreed objectives and delivering aligned services as part of a co-ordinated direction for government
- cost-effective – prioritised, planned, implemented, measured and evaluated as part of government priorities, and appropriate to need
- delivered within a single, integrated government ICT environment – provided to government, the community and individuals via an interoperable, secure, flexible ICT environment
- user-centric – understanding users' needs more clearly; remaining accessible, trusted, transparent and accountable; managing user expectations effectively
- supported by a capable workforce – supported by a skilled, well-informed and adaptable workforce operating in a work environment which applies best practice.

Specific emphasis has been placed on the Health and the Education (Wagner et.al., 2005) (UNESCO, 2003) (in various countries including Central America, Chile, China, Columbia, Costa Rica, India, Kenya, Morocco, Namibia, Senegal, Singapore, South Africa, Thailand and comparatively United Kingdom) sectors, and there are numerous specific measurement approaches.

A guide to purchasing ICT has been produced by Accredit UK as a result of research undertaken with The National B2B Centre in 2007. This revealed the problems encountered by small businesses when making ICT purchases (European Regional Development Fund, 2008).

National School of Government, Sunningdale Institute, in UK discusses effective business models (Neely & Delbridge, 2007) in public sector.

Department of the Premier and Cabinet Government of Western Australia Office of e-Government (DPC, 2008) specifies Essential Factors for Successful ICT Projects.

Kanungo, Duda, and Srinivas (Kanungo et.al., 1999) state that "research in information systems (IS) indicates an absence of clear-cut models to assess IS effectiveness. While the costs are easily identifiable it is the benefits which are most difficult to assess due to the scope of impact of information systems."

There are more specific studies, such as Semantic Interoperability Community of Practice (SICOP, 2006) on business value of semantic technologies, and semantic process models in ICT impact analysis (Baacke et.al., 2008).

A study in Malaysia (Ramlan et.al, 2007) attempts to provide a statistical approach in using growth accounting to measure ICT contribution to aggregate output. The authors compare Malaysia, Singapore, USA, UK and EU countries.

Kamel, Rateb and El-Tawil (Kamel et.al., 2009) discuss the Impact of ICT Investments on economic development in Egypt.

In 2004, EU commissioned ICT Consortium to develop an Evaluation Framework (Ticher & Eaves, 2004), mostly an empirical study on groups, with a set of indicators covering the following areas:

- Decision-making and planning
- IT strategies, budgets and policies
- Use of ICT to assist in decision-making
- Measures to address inequalities in access to ICT (the "digital divide").

"Report on Transformational Government – enabled by technology" (Cabinet Office, 2005) states "Technology alone does not transform government, but government cannot transform to meet modern citizens' expectations without it… The vision… is also about making government transformational through the use of technology". Specified benefits are better more integrated customer services, reduced operational costs, better use of resources, purchasing clout, supporting specialisms, and realignment of front and back office.

UK uses higher level frameworks for the appraisal and evaluation of all policies, programs and projects, the Green Book (HM Treasury, 2009), and policy evaluation, the Magenta Book (HM Treasury, 2008b). Scotland and Northern

Ireland follows a similar approach on expenditure appraisal and evaluation (Scottish Government, 2009) (Department of Finance and Personnel, 2008). The Work Foundation (Collins, 2007) (Horner et al., 2007) establishes a link between PV and Willingness to Pay on a number of agencies including the BBC (BBC – Trust, 2008) (NAO, 2005).

There are other major models, not based on the PV concept. France, with their Mareva methodology (ADELE & Bearing Point, 2003-2005), Germany, with Economic Efficiency Assessment WiBe (WiBe, 2010), and Denmark, with 'eGovernment signposts' methodology (Nielsen, 2005), have country-wide standardized assessment methods, with no specific reference to agency SPs, and continuous monitoring and evaluation frameworks.

In Mareva methodology (ADELE & Bearing Point, 2003-2005) for assessing the value of a proposed investment, value analysis is based on 5 complementary components: profitability, necessity, risk control, internal considerations (public domain), and external considerations (for individuals). Mareva's value definition includes profitability for the state such as costs and financial benefits in terms of productivity/efficiency gains and increased revenue; internal aspects such as employee satisfaction, the effects of decentralization and improvements in service efficiency; external aspects in qualitative (quality of service, social impact) and quantitative terms (time and money savings); and necessity such as regulatory compliance or efficiency objectives. In addition to these criteria, Mareva looks at different risks, such as project (in terms of clarity of objectives, budget and schedule), legal, technical (complexity and degree of innovation) and deployment (staffing, continuity of service and political support). The Mareva model does not provide clear management for portfolio management. In the model, the dimensions of the PFM Value Space (PFMVS) cover high level program, program component project, and activities which constitute the basic expenditure framework in performance based budgeting, have been defined. The objectives, associated with service delivery value chains (processes) have been defined in another dimension, with a link at the function, activity and the task level.

WiBe focuses on costs and benefits (in monetary terms), urgency (such as regulatory compliance), qualitative and strategic importance (such as relevance to other agencies, vendor independence, image improvement and attractiveness of working conditions, and external effects (customer demand, economic impact, increase in timeliness and quality). WiBe also provides acceptance rules of the proposed projects based on these focus areas. However, the prioritization mechanism does not seem to be effective as it is based on a threshold system. If at least one value dimension reaches a given threshold, the investment can be considered for funding, without analysing the other factors. The SMM developed at the MoF envisages linking the goals and objectives of the agencies to high level state and government-wide policy documents; and therefore the indicators have been defined as qualitative and quantitative, based on a set of centrally managed indicator catalogue at the MoF. Hence rather than performing the assessment of the expenditure to a separate exercise, the model links it directly to the objectives, indicators, projects/activities and daily service (PV) delivery processes.

The Danish 'eGovernment signposts' methodology (Nielsen, 2005) provides for a more global eGovernment approach with the related measures:

- Coherent services with citizens and businesses at the centre
- Increase services quality and release resources
- Work and communicate digitally
- Coherent and flexible ICT infrastructure
- Managers ensure that organisations capitalise the vision

Canada uses outcome management - activities for the planning, managing, and realizing the desired outcomes from initiatives. Norway ensures benefits through CBA, standard indicators and post project evaluation.

A research team, managed by Esselaar worked on ICT Diffusion and ICT Applications in Usage Sectors in South Africa (Esselaar et.al., 2002).

Further details on a few selected methodologies will be provided in the following sub-sections.

2.2.1. ICT Investment Framework / ICT Business Case

The DVAM methodology (of the Australian Government) is developed by AGIMO (AGIMO, 2004), and a new version replaced the first version as the ICTBC Guide (ICTBCG) and Tools as part of Australia's ICT Investment Framework (AGIMO, 2008). The Guide and Tools are available to download by visiting the Business Case Guide and Tools page, which requires secure login to the page. DVAM includes 5 Value Categories:

1. Agency benefits/value - Financial (quantitative) e.g. operating cost reductions, increased revenue, improved efficiency and productivity savings, improved effectiveness, improved service or cycle times, and increased staff retention;
2. Strategic value (qualitative) - how well the initiative is aligned with the most important outcomes (and political objectives) for the organization;
3. Consumer/user financial value - time and cost savings, faster payments and revenue generation opportunities to users of a service;
4. Social benefits/value (economic and non-economic) - encompassing both reach and impact in areas of improved quality of life; improved decision making; and more integrated delivery so increasing business opportunities; and
5. Governance value - i.e. contribution to broader whole-of-government objectives including more open and inclusive government (citizen participation), accountability and improved information availability (transparency).

These are combined with assessments of Risk to program delivery and to achievement of benefits.

Ratings are provided for agency value (financial), user financial value, social value, governance value, strategic alignment, risk to program delivery, and risk to achievement of benefit. ICTBC also allows comparison of programs within and between agencies.

This model identifies three main phases to build a business case, namely, identifying the business need and alignment with strategic and IT priorities, providing a high-level analysis of benefits, costs and constraints of the intended investment against different options, and the detailed analysis of the business case, looking at financial and nonfinancial benefits, costs, and risks. Last two phases provide additional information related to governance and quality control. The benefits are defined similar to the VMM: internal economic, external economic (user/agency benefits), qualitative (social value, service delivery value, government policy alignment, government strategy alignment, agency policy/objective alignment, comparable projects, stakeholder support, mainstream implementation, environmental considerations). This framework chooses to distinguish between quantitative and qualitative measures. Although this categorization favours quantitative vs. qualitative, it is easier to understand and simpler to implement. The model, at the higher level follows a similar approach.

Although scoring for a single value is criticised by Gartner (Di Maio, 2007), Gable (Gable et al., 2008) states that "*a validated and widely accepted such index would facilitate cumulative research on the impacts of IS, while at the same time providing a benchmark for organizations to track their IS performance*". In this research, the approach of having one single index is taken, in addition to multiple indices for different value categories for the measurement of the success and impact of the IS investments. ICTBC is more practical model, however it only check for the existence of SP link, and monitoring is left to the proposer.

2.2.2. Value Management Methodology

VMM (Rachlin & Marshall, 2002a; 2002b), which is used by USA agencies, focus on major value factors from which the value hierarchy is developed as:

- Direct Customer Value: Benefits to customers/clients, e.g. convenient access, product enhancement;
- Social Value: Benefits to society as a whole, e.g. reducing CO2 emissions;

- Operational Value: Better operations and lowering barriers to future initiatives, e.g. improved infrastructure;
- Strategic Value: Contributions to strategic initiatives and fulfilling the mission of the organization; and
- Financial Value: Financial benefits, including increased revenue, decreased costs, and cost avoidance.

VMM is also used in Performance Reference Model (PRM) (EOP, 2007), which is a standardized framework to measure the performance of major IT investments and their contribution to program performance. PRM follows the PV chain of inputs (human capital, technology, other fixed assets), outputs (processes and activities) and outcomes Mission and business results, customer results), using Measurement Area, Category, Grouping, and Indicator hierarchy. VMM proposes using a Decision Support Tool, based on rather old but practical AHP, for prioritizing the value factors, and Uncertainty Analysis and Sensitivity Analysis for costing. RoI, cost and value scores are calculated and calculations add up to "value score", hence VMM merges Value, Risk and the Cost Factors in a single index. There is no mandate to use standardized set of indicators, differing by domain, and "*once calculated individual value factors are not visible*" (Di Maio, 2007).

VMM investigates value/risk/cost on one dimension and input/analysis/output in the other. Defined outputs are the expected value score, risk score, risk adjusted expected RoI, expected cost, and expected RoI. Value factors include direct customer (user), social (benefits to society), government operation, government financial and strategic/political. VMM suggests selecting different measures for different types of investments; but measures can be chosen from a domain specific standard set. It is recommended to use a set of indicators in the hierarchical structure of Goal Indicator → Performance Indicator → Metric, as implemented in SMM. In VMM, different weighted value factors are combined to provide a single value score. In order to agree on relative weights for different value factors, an AHP tool will be used. Although this approach is feasible, the relative weights are frozen at the beginning and during program management, the individual value factors are no longer visible. In the model, it is proposed to link expenditure

directly to objectives, which have been defined as part of the strategic and operational planning. Hence, applying weighted selection criteria at the execution level, it is proposed to have it applied at the planning level.

In the US, different states may have their own valuation methods. For example, applications to the Iowa RoI program (Huston & Gillispie, 2009) consist of five sections: a proposal description, a project administration plan, a description of the technology, a financial analysis and evaluation criteria. The criteria include statutory requirement, customer service, impact on citizens, reengineering government processes, project participants, risk, experience and past performance, funding requirements, additional funding sources, and financial RoI.

2.2.3. eGEP Measurement Framework

EU has funded eGEP Measurement Framework (Codagnone et al., 2006) to deliver an econometric model for assessment. eGEP focuses on red tape, beneficiary value and inclusion regarding the effectiveness. eGEP framework is based on three value pillars: Financial & Organisational Value, Political value, and Constituency Value.

eGEP discusses measuring ICT effect on economic growth using approaches such as Average Labour Productivity (ALP), Multi-Factor Productivity (MFP) and Total Factor Productivity (TFP), their advantages and pitfalls; and proposes to have a different measure: average productivity (EGEP, 2006a):

$$Y \equiv N \cdot \pi \qquad \text{Equation (1)}$$

where

Y is the total output,

N is the number of productive workers, and

π is the average output per worker.

They also emphasize that the debate on the economic literature is not yet conclusive, nor concluded. The project team also discusses the productivity gap between Europe and the USA, and claim that this depends on institutional and cultural factors, and that economic growth is strongly dependent on the specific

productive structure of the country. It seems that ICT might affect positively economic performance. ICT adoption and diffusion should therefore be encouraged not only in the context of pursuing the Lisbon objective of increasing the international competitiveness of Europe through knowledge and technology, but also from a domestic growth perspective (EGEP, 2006b).

eGEP model can be broken down into five components:

1. Effectiveness/Efficiency Effect – or "Smith Effect",
2. Substitution / Integration between technology and personnel Effect – or "Ricardo Effect",
3. Back-Office Reorganisation Effect,
4. Investments in Innovation Effects, and
5. Other Take-up Driven Macroeconomic Effects.

with three indicators:

- ASCU: the Average Social Cost of Use of services;
- ASVU: Average Social Value of Use of services;
- PVU: Perceived Value of Use.

Though eGEP project defines some formulas for the measurement of the above-mentioned effects, regarding the services' effectiveness measurement, they capture that this is the biggest technical challenge for eGEP and an element to which an eGovernment impact assessment cannot renounce.

The eGEP framework identifies efficiency, the effectiveness of delivered services and democracy (in terms of openness, transparency and participation). Close correlation with an economic model enforces high focus on quantitative measures. A comprehensive model should combine qualitative and quantitative indicators. The trap is to focus more on quantitative indicators as they are easier to define, or using more than required internal measures (such as operational efficiency). The eGEP tries to balance quantitative and qualitative metrics, with relative importance in percentage terms, and with possible source of collection, such as administrative

records for personnel costs, input and output volumes, Web metrics data for software usage, official statistics, etc. As with the Turkish case, it is quite unlikely to have a meaningful baseline for the proposed measures, and the agencies will be reluctant to provide data for it unless it is an integral part of their daily operations. A system which does not capture performance data as part of operational process will have limitations on disjoint econometric modelling and feeding in data manually for evaluation. In the model, the performance and expenditure tracking is integrated as part of budget preparation and budget execution processes.

Another EU–wide approach was developed by Cap Gemini, the EU Performance Framework (Cap Gemini, 2003; 2007).

OECD is no exception by their eGoverment evaluation (Lau, 2007). Lau lists types of e-government evaluation methodologies.

Table 3. OECD Government Evaluation Methodologies

Method	Description	Use
Transaction costs	Uses segmentation methods to calculate use and benefits to different user groups	Quick and easy way to estimate potential cost savings from the introduction of e-government
Net present value	A straightforward method that examines monetary values and measures tangible benefits	Relatively straightforward; use when cash flows are private and benefits tangible
Cost-benefit analysis	A flexible method that measures tangible and intangible benefits and assesses these against net total cost	Good consideration of all benefits, but can be expensive and time consuming
Cost effectiveness analysis	Focuses on achieving specific goals in relation to marginal costs	Good for considering incremental benefits against specific goals
Portfolio analysis	A complex method that quantifies aggregate risks relative to expected returns for a portfolio of initiatives	Good for consideration of risk, must use a consistent approach across a portfolio
Value assessment	A complex method that captures and measures benefits unaccounted for in traditional RoI calculations	Used by several governments to consider performance against all policy goals

2.2.4. Public Return on Investment

Center for Technology in Government (CTG), Albany tries to redefine the RoI for the government of the USA IT investments (Cresswell, 2010). Through Public RoI Value Propositions, CTG defines six kinds of impacts government IT can have on the interests of public stakeholders: financial, political, social, strategic, ideological and stewardship. This is a framework without a scoring attempt.

CTG tries to re-define RoI for the government of the USA IT investments (Cresswell et.al., 2006). They identify three significant shortcomings:

- Incomplete analysis of PV, resulting in too narrow a scope of what can be considered returns to the public.
- Lack of systematic attention to how government IT investments generate results of value from the point of view of the public.
- Weak or absent methods for tailoring a public RoI assessment to the specific context and goals of a government IT investment.

They also define six kinds of impacts government IT can have on the interests of public stakeholders:

- Financial – impacts on current or anticipated income, asset values, liabilities, entitlements, and other aspects of wealth or risks to any of the above.
- Political – impacts on personal or corporate influence on government actions or policy, role in political affairs, or influence in political parties or prospects for current of future public office.
- Social – impacts on family or community relationships, social mobility, status, and identity.
- Strategic – impacts on economic or political advantage or opportunities, goals, resources for innovation or planning.
- Ideological – impacts on beliefs, moral or ethical commitments, alignment of government actions or policies or social outcomes with beliefs, or moral or ethical positions.
- Stewardship – impacts on the public's view of government officials as faithful stewards or guardians of the value of the government itself in terms of public trust, integrity, and legitimacy.

through Public RoI Value Propositions as follows:

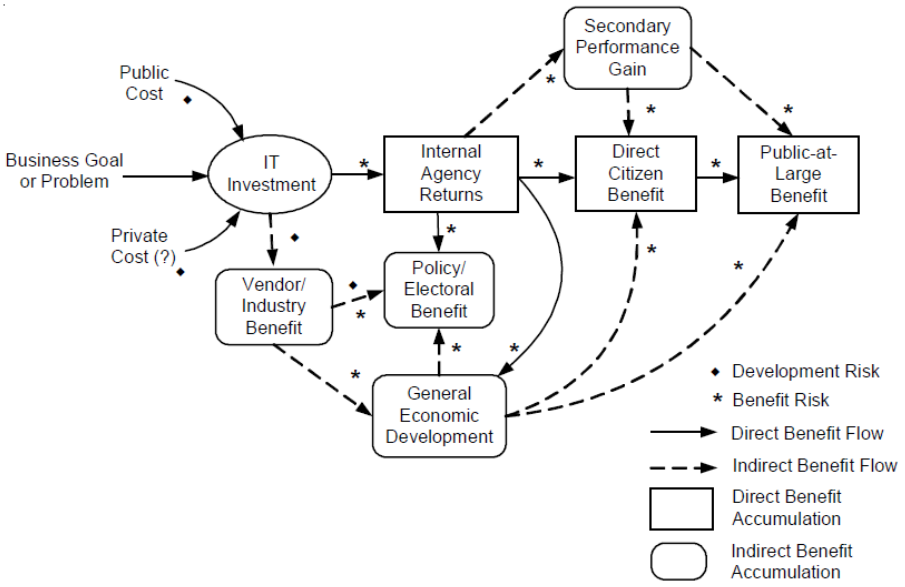

Figure 1. Public Return on Investment Value Propositions of CTG

Albany's Government RoI, being a higher level approach, cannot be put directly into implementation.

2.2.5. Public Value Models

Accenture's Public Sector Value Model is developed through the cooperation of private sector (AGIMO, 2004) (Finnegan, 2003) (Jupp & Younger, 2004) (Cole & Parston, 2006). Similarly, Gartner has developed a model (Di Maio, 2007) for assessing the PV of IT, with no index for cross-comparisons.

Younger and Coughlin (Younger & Coughlin, 2004) discuss the Accenture's Public Sector Value Model as a tool to measure value creation and evaluate trade-offs between public outcomes and economic value creation – often competing agendas. This reflects lessons as posts are public agencies, and are providers of universal service. Outcomes for the Public Sector Value Model are related with pricing, quality, accessibility, equality, responsiveness and availability.

2.2.6. Common Characteristics of Country Models

These comparative country-wide models all try to capture different aspects of PV, which can be summarized into the three dimensions of Gartner PV for IT (operational efficiency, constituent service and political return). Extensive analysis shows that there are no fundamental differences. Commonalities between all these approaches and methods can be summarized as follows:

1. The definition of value is similar, including hard to measure non-financial benefits:

   Value = f(Organisational, Government, Community, Financial), and — Equation (2)

   Public Value = f(User, Social, Government, Financial, Strategic); — Equation (3)

2. The outcome is the Result, which can be represented as *f(value, cost, risk)* as correctly captured and taken into account in all international models; and similarly, impact is the longer term effect of the implementation of the government policies on the public at large;
3. Government transformation through the use of technology is emphasized;
4. The 3E rule of Economy, Efficiency and Effectiveness in services is generally considered together, with one missing component in almost all of these approaches, which is the value associated with one of the most vulnerable entities as repeatedly have been seen in the near past, namely the Environment;
5. Service issues relate directly to policy, strategy, planning, organisation development and the business of government, and the service delivery is not only limited to ICT;
6. Coordination, collaboration, cost-effectiveness, integration, user-centricity, and workforce capacity are the basic principles of service delivery;
7. Resolution of data collection and usage issues; analytical techniques and tools assisting in decision making are major problems;

8. Cost/benefit should be balanced with risk management; and
9. Better practices should be shared.

The success of the models depends on:

1. how well it is integrated into the daily operations of the agency, such as budget planning (current and capital), and budget execution (including expenditure),
2. traceability to objectives for continuing political and public support,
3. standardization, consolidation and comparability across agencies, and
4. on demand data collection and analysis for adaptiveness.

2.3. Assessment & Public Audit

Similarly, different countries (UK, Italy, Australia, and USA) have developed methods evaluating eGovernment proposals that public funding can be used for. There are also performance audit and guidance reports by Accounting Offices of UK (NAO), USA (GAO, 2004a; 2004b; 2005; 2006; 2009) and Australia (ANAO, 2004).

For example ANAO specifies

- achievement of outcomes against service objectives and contribution to agency outcomes;
- cost effectiveness of the service;
- appropriateness and relevance to clients of the service;
- consistency with agency and Government objectives; and
- effectiveness of service provision using the Internet compared with other channels used for that service.

as the aspects of performance (ANAO, 2004). There also more specific audits on web sites (ANAO, 2008).

Internal Auditor, through the application of COSO Enterprise Risk Management model, have been trying to audit IS effectiveness (Applegate & Wills, 1999).

A study conducted by Pricewaterhouse Coopers, sponsored by the IT Governance Institute (ISACA, 2004) on a sample of 7000 respondents, found that one of the top ten problems cited by these respondents was the "inadequate view of how well IT is performing" and furthermore 80 percent are of the opinion that IT governance or some sort of governance mechanism was required to solve the issue.

Nico and Cusack (Nico & Cusack, 2007) try to combine COBIT and GQM to model the measurement of the control objectives of IS audit.

In India, Office of the Comptroller and Auditor General uses a questionnaire based approach for assessing IT applications (OCAGI, 2002).

In the ISACA manual (ISACA, 2009) covering

- Code of Professional Ethics
- IS Auditing Standards, Guidelines and Procedures
- IS Control Professionals Standards

Section S10 IT Governance, states that

- 03 The IS auditor should review and assess whether the IS function aligns with the organisation's mission, vision, values, objectives and strategies.
- 04 The IS auditor should review whether the IS function has a clear statement about the performance expected by the business (effectiveness and efficiency) and assess its achievement.
- 05 The IS auditor should review and assess the effectiveness of IS resource and performance management processes.
- 06 The IS auditor should review and assess compliance with legal, environmental and information quality, and fiduciary and security requirements.
- 07 A risk-based approach should be used by the IS auditor to evaluate the IS function.

- 08 The IS auditor should review and assess the control environment of the organisation.
- 09 The IS auditor should review and assess the risks that may adversely affect the IS environment.

but does not specify the method or methodology used to assess the effectiveness of ICT.

ITGI proposes RiskIT (ITGI, 2009a) method for managing enterprise risks.

2.4. Domain Specific Approaches

Rickard has developed a Structured eMentoring model (Rickard, 2007) by extending the IS Success model developed by DeLone and McLean's IS dimensions (DeLone & McLean, 1992; 2003) for the mentoring context and represents effectiveness on effectiveness pentagon, which is generally called a spider-gram.

There are numerous software related methods, including newer models such as QEST and LIME. In QEST (Quality factor + Economic, Social and Technical dimensions) multidimensional performance measurement model is used for software development. "In the QEST model, the measurement of performance (p) is defined as the integration of an instrument-based measurement process (expressed in the model by the component RP - Rough Productivity) with a perception-based measurement process based on the subjective perception of quality (expressed in the model by the component QF - Quality Factor)." (Buglione & Abran, 2008)

Costello, Sloane, and Moreton (Costello et.al., 2007) specifically investigate value contribution to SMEs. They capture that there are many IT evaluation frameworks available for business, but that there is no one model that can claim to cover all of the necessary variables.

Roldán and Leal (Roldán & Leal, 2003) propose for the adaptation of the DeLone and McLean's Model in the Spanish Executive IS field, and apply the Partial Least Squares (PLS) technique to test the model they propose, using data from a survey conducted on 100 Spanish users in 55 organizations.

Vaidya (Vaidya, 2007) uses the DeLone & McLean IS Success Model to measure public e-Procurement success.

Parida (Parida, 2006) investigates utilizing multi-criteria hierarchical frameworks for maintenance performance measurement.

Lindfors, in his doctoral thesis (Lindfors, 2003), focuses on housing development process.

Myers, through questionnaires, develops a framework based on contingency theory in his PhD thesis (Myers, 2003).

Bruning (Bruning, 2005) discusses E-Bay, Dell Computer, and Amazon.com models.

Cameron (Cameron, 2005) provides a work on IT Portfolio Management regarding the business-IT alignment.

Chabrow, in Information Week (Cahbrow, 2006), proposes new metrics in measuring IT's value, Missed Opportunities, Client Impact, Self-Help, Staff Mix, Tied To Profit, Perception Counts, Development Speed, Dropouts, Sales Engine, Innovation, No Train, No Gain, and the Ultimate Test. He provides for the example of Vanguard, which regularly surveys its employees about their outlook, and CIO Heller looks to two key questions: Would I recommend my area to a co-worker, and would I recommend my boss to a co-worker? Heller thinks it's a good measure of how engaged people are in their work.

Assessment at R&D organizations (Askar & Aytac, 2004) can be performed as:

- Vertical assessment: evaluation of policies, units, programs, projects, employees; and
- Horizontal assessment: evaluation of alignment with vision, functional coverage, duplications in units/programs/projects, knowledge sharing and synergy creation.

Final evaluation, the last phase of three stage evaluation, which is a post mortem analysis, should answer questions such as "how well did the project achieve project objectives?", "did the project meet stakeholders' expectations ?", and "did the cost justify the work?". This work distinguished between outputs and outcomes, and

recommends checking for alignment of outcomes with objectives. The authors also emphasize the importance of data collection.

2.5. Scorecards, Governance and Linking IT with Strategy

The multidisciplinary approaches include Balanced Scorecard (Kaplan & Norton, 1992; 1993; 1996a; 1996b; 2000; 2003; 2006), BSC for the IT Function (Grembergen & Bruggen, 1997) (Arrianto, 2007), IS Scorecard and e-Commerce Scorecard.

Linking the IT with strategy has been extensively handled in BSC (Kaplan & Norton 1996a; 2006) approach, which is later modified for public and non-profit organizations (Niven, 2008). The original dimensions designed for private sector with financial focus, namely Financial, Customer, Internal Processes, Learning and Growth, have been modified to include mission, putting strategy at the centre, introducing the concepts of value and benefit, financial and social costs, customers and constituents. Based on BSC, there have been adaptation works to develop IT BSC (Grembergen & Bruggen, 1997) (Grembergen & Haes, 2005) in line with IT governance, mapping Financials into Business Contribution, Customer to User Orientation, Processes to Operational Excellence, and Learning to Future Orientation. The major contributions have been towards business-IT alignment based on vision and strategy, and the concepts of better measurement using KGIs and KPIs. IT BSC has IT focus, rather than benefits.

2.5.1. ICT Balanced Scorecard

Similar to the VMM, ICT Balanced Scorecard (DeBoer et.al., 2001-2002) (Grembergen & Bruggen, 1998) identifies the following perspectives:

- Financial Perspective: How do our software processes and SPI add value to the company?
- Customer Perspective: How do we know that our customers (internal or external) are delighted?

- Process Perspective: Are our software development processes performing at levels sufficient to meet customer expectations?
- People Perspective: Do our people have the necessary skills to perform their jobs and are they happy doing it?
- Infrastructure & Innovation Perspective: Are process improvement, technology and organisational infrastructure issues being addressed to implement a sustainable improvement program?

2.5.2. IT Governance

IT governance is an integral part of enterprise governance. It "consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives" (ITGI, 2003). The ITGI states that "the management process which ensures delivery of the expected benefits of IT in a controlled way to enhance the long-term success of the enterprise" (ITGI, 2000).

The voluntary Australian Standard AS8015-2005 (Standards Australia, 2005) and the new standard IS0/IEC 38500:2008 (ISO, 2008) have emphasised the importance of IT Governance for organizations. There are also related international standards and approaches, such as ISO/IEC 27001 and 27002 (ISO, 2005), ISO/IEC 12207 (ISO, 2004a), ISO 15504-4:2004 (ISO, 2004b), ITIL (OGC, 2005), ITSM (ITSM, 2007) and CMMI (SEI, 2007).

The ITGI has identified that IT governance consists of five key focus areas (ITGI, 2003):

1. strategic alignment of business and IT,
2. delivery of value from IT systems,
3. risk management of IT systems,
4. management of IT resources, and
5. measurement of the performance of IT systems

and has aligned ITGI deliverables with IS0/IEC 38500:2008 (ISO, 2008), with the following principles (ITGI, 2009b):

1. Responsibility: Appropriate governance organisational structures, roles and responsibilities are required to be mandated from the executive, providing clear ownership and accountability for important decisions and tasks.
2. Strategy: The goal is to deliver value in support of strategic objectives while considering the associated risks in relation to the board's appetite for taking risks.
3. Acquisition: Implementation is also not just a technology issue but rather a combination of organisational change, revised business processes, training and enabling the change.
4. Performance: Two critical governance success factors are the approval of goals by stakeholders, and the acceptance of accountability for achievement of goals by directors and managers.
5. Conformance: IT-enabled change, including IT governance itself, usually requires significant cultural and behavioural change within enterprises as well as with customers and business partners.
6. Human Behaviour: Issues such as privacy and fraud are growing concerns for individuals, and these and other risks need to be managed if people are to trust the IT systems they use.

Van Grembergen and De Haes utilize the IT Balanced Scorecard to develop an IT Governance Balanced Scorecard (Grembergen & Haes, 2005). Van Grembergen, De Haes, and Van Brempt later extended the ITG BSC approach to examine the relationship between structures, process and relational mechanisms (Grembergen et.al., 2007).

The Australian authors Buckby, Best, and Stewart (Buckby et.al., 2009) propose that For ITG to become an accepted part of organizational governance processes in the same way that corporate governance has been accepted, ITG research needs to develop models which encompass all focus areas of ITG. The models would also need to incorporate measurement methods which could be based on prior research

in performance measurement. According to them, possible research questions which could be considered in the future in this focus area are as follows:

- Do effective strategic alignment processes lead to more effective ITG?
- Are strategic alignment processes linked to improved organizational performance?
- Which of the existing strategic alignment models best explain the relationship between business and IT within an organization?
- What are the similarities and differences between the existing strategic alignment models?
- What are some practical recommendations organizations could use to improve their strategic alignment processes?
- How does assessing maturity of strategic alignment processes assist an organization to improve their ITG processes?
- Does the establishment of ITG processes in an organization lead to improved value delivery from IT systems?
- What are some practical recommendations to assist organizations to improve their value delivery processes?
- Does measurement of value delivery from IT systems (post implementation) lead to improved organizational performance?
- What are the most effective methods of measuring value delivery from IT systems?
- How regularly should value delivery be assessed for organizational IT systems?
- What practical methods could organizations use to better measure ITG focus areas?
- How can maturity models be developed for all ITG focus areas and how can an overall ITG maturity be successfully measured?

- Would the development of an ITG strategic informational dashboard assist organizations to improve their ITG processes?

These authors (Buckby et.al., 2009) also state that despite extensive research in each of the focus areas, considerable work is needed to further the understanding of ITG and to develop a successful holistic measure of ITG. They emphasize the importance of developing more practical methods for organizations to use in establishing and assessing ITG.

A survey by ITGI (ITGI, 2008a) performed on 51 enterprises in Austria/ Germany/ Switzerland, Canada, Mexico, Philippines, Singapore and USA; which are grouped into capital-intensive industries (other than utilities), utilities, service industries, financial institutions, and government and non-profits show one key message (PWC & ITGI, 2009) to be taken by executive management is still measurement of what IT brings (or does not bring) as value to the enterprise.

2.5.3. COBIT and ValIT

ITGI provides for COBIT and ValIT. The approach is based on the ITGI Pentagon with 5 faces as (ITGI, 2008b):

1. Strategic alignment: Focuses on ensuring the linkage of business and IT plans; on defining, maintaining and validating the IT value proposition; and on aligning IT operations with enterprise operations
2. Value delivery: Is about executing the value proposition throughout the delivery cycle, ensuring that IT delivers the promised benefits against the strategy, concentrating on optimising costs and proving the intrinsic value of IT
3. Resource management: Is about the optimal investment in, and the proper management of, critical IT resources: applications, information, infrastructure and people. Key issues relate to the optimisation of knowledge and infrastructure.
4. Risk management: Requires risk awareness by senior corporate officers, a clear understanding of the enterprise's appetite for risk, understanding of

compliance requirements, transparency about the significant risks to the enterprise, and embedding of risk management responsibilities in the organisation.

5. Performance measurement: Tracks and monitors strategy implementation, project completion, resource usage, process performance and service delivery, using, for example, balanced scorecards that translate strategy into action to achieve goals measurable beyond conventional accounting.

ITGI chain can be read as “IT resources and processes provide information to business processes for achieving business objectives”.

ITGI defines effectiveness as “dealing with information being relevant and pertinent to the business process as well as being delivered in a timely, correct, consistent and usable manner”. The IT resources identified in COBIT are defined as:

- Applications are automated user systems and manual procedures that process information.
- Information is data that are input, processed and output by IS, in whatever form used by the business.
- Infrastructure includes the technology and facilities, such as hardware, operating systems and networking, that enable the processing of applications.
- People are the personnel required to plan, organise, acquire, implement, deliver, support, monitor and evaluate IS and services. They may be internal, outsourced or contracted, as required.

IT resources are managed by IT processes to achieve IT goals that respond to the business requirements. This is the basic principle of the COBIT framework, as illustrated by the COBIT cube. This is based on the 6C approach to scorecard implementation (Chang & Morgan, 2000):

- Collect: Collect information.
- Create: Create the scorecard design.

- Cultivate: Cultivate acceptance and the measurement culture.
- Cascade: Cascade measures down through the organisation.
- Connect: Connect objectives and measures to employees.
- Confirm: Confirm effectiveness through evaluation leading to ongoing improvement.

The COBIT (ITGI, 2008c; 2008d; 2008e; 2008f; 2008g; 2008h; 2008i; 2008j) complementary ValIT approach by ITGI (ITGI, 2008k; 2008l;2008m; 2009c), based on processes, grouped under Value Governance, Portfolio Management and Investment Management.

The VALIT framework identifies three mains processes: value governance, portfolio management and investment management. In each of these processes, a set of key management practices is put forward, addressing issues such as defining evaluations criteria per investment category (VG11), monitoring and reporting on portfolio performance (PM14) and developing a detailed program business case (IM8).

2.5.4. Comments on the Alignment through Balanced Scorecard

Although used in US Value Measuring Methodology (VMM) (Rachlin & Marshall, 2002a; 2002b), BSC cannot be used alone because it does "*not stipulate measures, but rather offer a methodology for identifying measures*" (Gable et al., 2008). This is in line with the practical experience in Turkey, where BSC was found not applicable at a policy making public organization.

Benefiting from the private sector approach of RoI, and realizing that the public agencies do not exist to make profit, others (Cresswell, 2004) (Cresswell et al., 2006) (Ralser, 2007) propose RoI for government framework as conceptual models.

Unfortunately, none of these models are applied as country-wide models in either selecting or assessing the IS investments especially for the public sector. A recent comparative study on e-Government (Pardo & Styrin, 2010) emphasizes paradigm change towards service oriented interaction between government and society, and program management covering strategic goals, key stakeholders, financial

resources, processes and indicators. Despite the fact that there are higher level government bodies in various countries trying to manage the e-Government planning and management through government level policies, strategies, guidance and practice-sharing documents; there still exists "*lack of coordination, monitoring and control over suppliers*".

2.6. Financial Assessments – Return on Investment

There are also private consulting companies, trying to provide RoI for organizations and agencies. When calculating the RoI, the formula is used:

RoI = Net Program Benefits / Program Costs x 100 Equation (4)

where

Net Program Benefits = Program Benefits - Project Costs Equation (5)

Program Benefits = linked to what is being measured: increased productivity, improved efficiencies, increased throughput, etc.

Net Present Value is defined as (Gardner, 2000)

$$NPV = \sum_{t=0}^{t=n} ((B_t - C_t) / (1 + r)^t)$$ Equation (6)

where

B = Benefits;

C = Costs;

r = discount rate;

t = time period;

n = number of time periods.

t = 0 (the initial start-up of the program)

t = n (the final year of the program)

APQC (APQC, 2008) identifies the following measure groups:

- cost effectiveness

- cycle time
- process efficiency
- staff productivity
- supplemental information

The RoI in ICT in evaluating the effectiveness is tried to be applied to the public sector as well, by several studies of the CTG, Albany, SUNY (Cresswell, 2004) (Cresswell & Burke, 2006) (Pardo & Dadayan, 2006) (Burke & Cresswell, 2006).

Rico, a systems engineer from USA, links Enterprise Architecture to a framework for measuring the RoI (Rico, 2006).

Office of Inspector General (OIG, 2009) specifies that the RoI from IT investments varies directly with the degree to which the technology transforms core operations.

2.7. Performance Indicators and Measurement

AGIMO, after defining "A critical success factor (CSF) represents a factor that must be present if an objective is to be attained. Achieving success and avoiding failure at an enterprise, business unit or project level depends upon organisations identifying and assuring 'compliance' with CSFs." and "A key performance indicator (KPI) is a specific measure of an organisation's performance in an area of its business. It is a general concept, with different implementations depending on the type of business and goals of the organisation. KPIs are a particular category of Performance Indicators and provide an organisation with quantifiable measurements of factors it has determined are important to its long-term success." discusses indicators. PIs are categorized into Investment, Financial, Human Resources, Service, Procurement and Contractual, Development, Training & Support, Operations, Systems, Risk Management, and Management and Governance. Another categorization is based on stakeholder roles: Secretary / Chief Executive, Deputy Secretaries / Senior Executives in Charge of Programs or Business Units, Chief Information Officer / Chief Technology Officer, ICT Steering Committee, Project Managers, Project Steering Committee, and Manager – Systems Development (AGIMO, 2006).

All PIs require the collection and presentation of information. In many cases aggregation and analysis of information is required. Most important of all is the people factor; who provides for the information, what about integrity and correctness, is it complete, does the set represent the totality, is it update, who owns the information, who is the custodian, who can access this information, what are the security implications, how often the information is collected, for how long it is stored, who accessed it, when and why (audit trails), who to report it to, when and why, how often, is it static, cognitive factors in presentation, is the presentation to be through dashboards, traffic lights and/or graphs, where and from whom to collect data from (program and/or project offices, accounting functions – both financial and management accounting, human resources functions, quality assurance functions, compliance functions and help desks), etc.

Approaches to data collection include:

- Quantitative
    - Quantitative descriptive or inferential data analysis.
    - Statistical analysis. This involves the statistical interpretation of data.
    - Synthetics. This represents the building of synthetic data from collected data.
    - Exceptions technique. Results are produced by applying tolerances to data to producing an acceptable range. When results fall outside the range they are flagged for attention and possible managerial intervention (corrective action).
    - Research standards and norms for benchmarking against other similar organisations and the private sector with similar systems, e.g. banks.
    - Balanced scorecard method.
    - Dashboard readout of business intelligence reading real-time intelligent knowledge metrics from the business process.
    - Financial and economic analysis, including various management accounting techniques, RoI, NPV, CBA, and IRR.

- Operations Research Technique may be drawn for industrial engineering and work study which are generally quantitative.
- Observation studies using check lists or other systemic forms.

- Qualitative
  - Qualitative data analysis. This includes analysis of user records by webmasters, system administrators, etc.
  - Surveys and/or questionnaires of take-up, approval and acceptance. Survey questionnaires can be conducted by: mail, email, web, or occasionally face to face. Needs to be well designed and piloted.
  - Telephone survey / interview. Telephone interviews may be more valid than either written or face to face interview.
  - Face to face. This is really a questionnaire for which the information is collected by and interviewer rather than being completed (penned) by the contributor.
  - Automated e-survey by email to users.
  - Community consultation.
  - Public, community, agency or stakeholder submissions.
  - Focus groups with 5-10 participants.
  - Nominal Groups. This is a brain storming type exercise to identify problems, propose solutions and prioritise actions.
  - The normal group technique for brain storming, possibility thinking.
  - Observation of people should be “unobtrusive” (subjects should be unaware so as to avoid influencing the result).
  - Diaries and activity logs.
  - Audit using different strategies, including interviews, desktop analysis and random or targeted sampling across the following dimensions: vertical, horizontal, project, department, procedure, and process.

- Observation studies using check lists or other systemic forms.
- Behavioural analysis. An analysis and interpretation of human behaviour, particularly in terms of user behaviour changes, patterns, cycles, growth trends, but also of service providers, such as help desk and call centre staff.
- Custom analysis using: Demand and value (DAMVAM / DVAM) (AGIMO, 2004); Accenture Public Sector Value Model (PSVM) (AGIMO, 2006) (Finnegan, 2003) (Milack & Rettie, 2006) (Accenture 1998 - 2001) (Jupp & Younger, 2004); Cap Gemini / EU Performance Framework.
- SWOT analysis. SWOT = Strengths, Weakness, Opportunities and Threats. The objective is to identify the SWOT and then develop actions, because without appropriate action a SWOT is impotent. Actions should capitalise on strengths, minimise weakness, exploit opportunities and neutralise threats. Such action should be fully integrated with a business plan, or become a business plan.
- Case studies. Learning by examining previous cases of successful, partially successful or failed projects. These projects may have some area of commonality through the agency, management team, system of governance, technology or stakeholder/s, etc. (AGIMO, 2006)

The use of automated collection, analysis and reporting through some software tools enables the management expand their 'span of control', which is 5 – 9 (7 is optimal). The same concept can be applied to the number of Performance Indicators, the principle being that one person should only have to monitor a limited range of PIs. The Victoria State Government, in its new Benefits Management Programme, specifies that "7" benefits be measured and that each has no more than two KPIs (AGIMO, 2006).

The approach above also links results to the strategy.

2.7.1. Measuring Value

Value can be measured as (Sullivan, 2006)

- value-based (value category, alignment with vision and strategy, satisfaction and quality of knowledge, etc.);
- vector-based (rate of increase/decrease, backlogs, market share, coverage, comprehensiveness and stock price, etc.);
- non-monetary (# evals/unit time, # of staff, age, remaining life, # units, etc.)
- monetary (invested amount, revenue, income, costs, profits, NPV, etc.)

Dimensions for value measurement can be summarized under five categories:

1. Purpose of measurement: (value? performance?)
2. What is it that is being measured? (objects e.g. assets, people, processes, organizations, programs/projects),
3. Perspective or Reference Point (owner, sponsor, buyer/payer, shareholder),
4. Timeframe (past, present, future)
5. Unit of measure and scale (value, vector, non-monetary, monetary; benchmarking, better practices, relative to owner or buyer, relative to market, relative to competitor)

OECD used the following checklist in 4 country 'eGovernment initiatives' assessments (Lau, 2007):

1. Checklist of benefits to government
    a. Direct cash benefits
    b. Efficiency savings (monetisable benefits)
    c. Time savings
    d. Information benefits
    e. Risk benefits
    f. Future cost avoidance

g. Resource efficiency

h. Other non-monetisable benefits

i. Improved service delivery

j. Enhanced customer service

k. Enhancements to policy process

l. Enhancements to democracy

m. Allows more, greater and new data to be collected

2. Checklist of benefits to users

    a. Monetary benefits

    b. Time-based non-monetary benefits

    c. Value-based non-monetary benefits (quicker response, improved information, improved reliability, choice and convenience, premium service)

Office of eGovernment (OEG, 2008a), UK, provides guidelines and checklists for ICT Programs and Projects.

Similarly, Department of the Premier and Cabinet, Government of Western Australia (OEG, 2008b; 2008c) provides a checklist for Ministers on major ICT Projects.

2.8. eGovernment Transformation and the Public Value

Melford (Melford, 2005) identifies the following stages in eGovernment transformation in his 2005 presentation "Beyond eGovernment, Transforming Public Services":

1. Promote access and connectivity;
2. Provide services online;
3. Transform the enterprise (first through automating the existing processes, then transforming business processes and organization);

4. Next generation government, IT enabled radically different means of providing services.

Transformation should be based on the "value delivery" to the public. Competing for the limited public funds emphasize basic 4E rule (Economy, Efficiency, Effectiveness, Environment [1]) in complex and chaotic Public Management. With operational fragmentation, lack of proper control & audit, it is evident that information kingdoms arise in silo/stovepipe approach. New concepts, such as value chain and PV emerge within the context of strategic management, covering risk management, performance management, process management and knowledge management. Based on these concepts, accountability and fiscal transparency emerge as the key approach in providing for economic, efficient and effective collection & utilization of public funds. Strategic planning is the central nervous system, transforming policy into goals, and goals into measurable objectives.

The concept of "public value" was first introduced by Mark Moore of Harvard. According to Moore (Moore, 1995), PV is both a practice whereby providers work with users to produce outcomes that genuinely meet users' needs and an aspiration to go beyond 'hitting the target but missing the point' and so re-orientate public bodies to 'ends' (such as 'health') rather than to 'means' (so many 'Consultant Episodes' completed for so much committed in resources). He suggest that to create public value, executives must address three key areas:

- Services – cost effective provision of high quality services;
- Outcomes – achievement of desirable end results; and
- Trust – support a high level of trust between citizens and government.

Mark Moore developed the PV scorecard to be applied to the non-profit organizations (Moore, 2002), suggesting that these organizations should focus on three related areas; value or social mission; legitimacy and support; and operational capacity.

[1] This 4th E, stands for the eco-system complementary to the classical 3E approach. (Guclu, 2006)

The Work Foundation has developed several reports (Work Foundation, 2006 - 2008) on PV with specific applications to UK agencies including the BBC (Collins, 2007) (BBC Trust, 2008). Establishing their approach to PV dynamic on three pillars, namely, creation, authorization and measurement; these case studies focused on how PV is authorised, how PV is created [2], how PV is measured, and how successful is the value delivery (assessment); and are structured as follows:

1. What PV does the organisation create? Qualities, Services, Outcome, Trust
2. How does the organisation create PV? Authorisation, Creation, Measurement

Two of the most common methods are willingness to pay (WTP) and willingness to accept (WTA). WTP captures people's willingness to pay to maintain a given level of provision and WTA captures what they would be willing to accept for a lower level of provision. Crucially, WTP is governed to a greater degree by income level than WTA, thus care must be taken when deciding on an approach to capturing value from users and potential users of a service (Cowling, 2006). The Work Foundation also investigates building a better evidence base to engage public (Coats & Passmore, 2008)

- Because they have to. In order to fulfil statutory obligations.
- Greater legitimacy. It will be easier to justify the decisions taken if it is possible to demonstrate that the local community has been involved in making them.
- Better quality decision making
- Building trust
- Increasing social cohesion
- Improving communications
- Managing the process

[2] This can be seen as the SERVICES and the SERVICE DELIVERY VALUE CHAIN (aka PUBLIC VALUE), a note by the authors.

PV measurement is essential for the accountability of public agencies, however cultural value cannot be fully captured in a casting up of economic or monetary value accounts (Holden, 2004).

According to Collins (Collins, 2007) the four drivers of PV are: reach, impact, quality and value for money. The National Audit Office assessed the BBC's performance measurement system based on these 4 criteria in 2005; and endorsed the BBC's approach by the comment "the BBC is at the forefront of current thinking on this topic" (NAO, 2005). Performance appraisal depends on domain specific KPIs developed for of these 4 drivers. The same approach was applied to the Royal Opera House, V&A Museum, Leicester College, London Borough of Lewisham recycling scheme, London Borough of Lewisham and Lewisham PCT tobacco control services, Lancashire constabulary Quality of Services scheme, and The Capita Group plc with London Borough of Harrow (Horner et.al., 2007). These case studies focused on

1. how is PV authorised,
2. how is PV created, [3]
3. how is PV measured,
4. how successful (assessment)

and structured the approach as follows:

3. What PV does the organisation create?
    A. Qualities (universal, equitable/equity, accountable, transparent)
    B. Services (satisfaction, information, choice, employee advocacy, ethos)
    C. Outcome
    D. Trust
4. How does the organisation create PV?

[3] This can be seen as the SERVICES and the SERVICE DELIVERY VALUE CHAIN (aka PUBLIC VALUE), a note by Guclu, N. 2009

A. Authorisation (construction, conception, ethos, democratic legitimation, methods of consultation, democratic accountability, political calculus, justifying resource allocation)

B. Creation (justifying resource allocation, PV as a strategic goal PV as a management tool, managing citizen expectations)

C. Measurement (why and what to measure, clarifying intentions, measurement that destroys PV, measurement that creates PV, public accountability)

There are other studies (Holden, 2004) (Kelly & Muers, 2002) (Prakash et al., 2008) for PV measurement.

Kelly and Muers (Kelly & Muers, 2002) emphasise the importance of the external rather than the internal environment of public sector bodies, the delivered value being seen in the eyes of the beneficiary. "Citizens derive benefits from the personal use of public services that are very similar to the benefits derived from consuming those purchased from the private sector". They also state "Good government requires citizens and their representatives to continually revise shared values and objectives through a process of public deliberation", "three broad dimensions of PV: services, outcomes and trust/legitimacy", and "An improvement in health outcomes generates value even if satisfaction with GPs/hospital services does not improve. Likewise, if trust in public institutions increases, value grows even if it does not flow from improved services or outcomes".

Prakash, Jaiswal, and Gulla (Prakash et.al., 2008) propose PV Framework for Enterprise Applications, and recommend the usage of three key dimensions to measure the PV of enterprise applications – Constituent Service, Productivity and Political Consideration. Their model has the following characteristics:

- Multidimensional model
- Mix of Quantitative and Qualitative Measures
- Common framework for both ex-ante and ex-post
- Framework which is both diagnostic and prescriptive

- Due importance to existing models from IS, Public Sector and Government, and Enterprise Applications
- Exclusion of resource capability
- Exclusion of profitability measures
- Usage of established theories/frameworks for the proposed dimensions

and try to combine the framework for PV of IT and value assessment of enterprise applications.

Comprehensive resources are provided by the UK Treasury, namely the Green Book (HM Treasury, 2009), and the Magenta Book (HM Treasury, 2008b). Scotland and Northern Ireland follow similar paths (Scottish Government, 2009) (Department of Finance and Personnel, 2008).

Recently, MoF, Turkey, has adapted an approach combining the above-mentioned approaches with Knowledge Lifecycle presented in The New Knowledge Management (TNKM) approach (McElroy, 2002) (Firestone & McElroy, 2003) by extending the model with Process and Semantic Integration (Guclu, 2006). The experience at the MoF has been based on a SMM (Guclu, 2006-2008), a PFMVS approach, linking budget execution (spending) to goals. Several dimensions have been defined, allowing for the operational staff and managers trace expenditure to measurable goals, supported by the new Public Financial Management and Control Law 5018, and the related amendments (MOF, 2009c).

2.9. Categorization of the Literature Survey

The measurement of value, performance and success (Sullivan, 2005) (VMRC, 2006) (Sullivan & McLean, 2007) (DeLone & McLean, 1992; 2003), including human capital (Andriessen, 2003), is an ongoing effort. A non-comprehensive list can be categorized as:

1. **Financial**: RoI (Gardner, 2000), RoI for the Government (Cresswell et al., 2006), transaction costs, cost allocation (Bannister & McCabe, 1999), NPV, Economic Value Added (USP, 2001), CBA, Cost Effectiveness Analysis, Earned Value Management (Ernst, 2006), Business Value Analysis

(Thomas, 2004), Portfolio Analysis, Value Assessment (Lau, 2007), Shareholder Value Measurement (Desjardins, 1997), Future Value Management (Ballow et al., 2004) (Langlinais & Merino, 2007), Accounting for the Future (AFTF) (Nash, 1998), Intangibles Value Stream Modelling (Sullivan & McLean, 2007), Total Value Creation (Anderson & McLean, 2000), Ernst & Young Value Creation Index (Low, 2000) (Cap Gemini, 2003) (Baum et al., 2000), Intel's Business Value Index (Sward & Lansford, 2007) (Intel, 2003) (Carty & Lansford, 2009), Forrester's Total Economic Impact (Symons, 2006), Applied Information Economics (HDR, 2004), Microsoft's Rapid Economic Justification (Microsoft, 2005);

2. **Indicators**: Balanced Scorecard (Kaplan & Norton, 1992; 1993; 1996a; 1996b; 2000; 2003; 2006) (Balanced Scorecard Institute, 1998-2009) (Palladium, 2009), Cognos Scorecards / Dashboards (Cognos IBM, 2009), AICPA Enhanced Business Reporting (AICPA, 2006-2009a; 2006-2009b), Global Reporting Initiative (Global Reporting Initiative, 2009), KPIs (Bray, 2002), Performance Prism (Neely & Adams, 2000) (Neely et al., 2002), QRP Scorecard (Wisconsin Technical College, 2009), SAP Value Measurements (SAP, 2006; 2007; 2008), Value Chain Scoreboard (Lev, 2001), KPMG Value Explorer (Andriessen et al., 1999) (Andriessen & Tissen, 2000), PWC Value Reporting (Eccles et al., 2001), Augmented Production Function Approach (Siegel, 2003), ICT Balanced Scorecard (De Boer et al., 2001-2002) (Grembergen & Bruggen, 1998), IT Governance Balanced Scorecard (Grembergen & Haes, 2005) (Grembergen et al., 2007), BSC for the IT Function (Wibowo, 2007), IS Scorecard, e-Commerce Scorecard, AGIMO CFS and PIs (AGIMO, 2006), APQC (APQC, 2008), OECD eGoverment evaluation (Lau, 2007), Sveiby metrics (Sveiby, 1996, 1997, 2001; 1996, 2001);

3. **Country/region specific approaches**:

    a. EC: EU framework for eCompetence (EC for Standardization, 2008), eGEP Measurement Framework (RSO, 2009) (EGEP, 2005) (Codagnone, 2007) (Codagnone & Cilli, 2006) (Corsi et al., 2006)

(Codagnone et al., 2006) (Codagnone & Osimo, 2008), Accenture's Public Sector Value Model (Younger & Coughlin, 2004), eBusiness Community Model (eBCM) (Haglund, 2008) (Sverrisson et al., 2008), Cap Gemini / EU Performance Framework (Cap Gemini, 2003; 2007);

a. OECD eGoverment evaluation (Lau, 2007)

b. UK: Accredit UK's guide to purchasing ICT (European Regional Development Fund, 2008), National School of Government effective public business models (Neely & Delbridge, 2007), ICT Consortium's Evaluation Framework (Ticher & Eaves, 2004), Transformational Government (Cabinet Office, 2005), HM Treasury and NAO in UK (HM Treasury, 2003; 2008b);

c. Other EU : French Mareva methodology (ADELE & Bearing Point, 2003-2005), German WiBe (Di Maio, 2007), Danish 'eGovernment signposts' methodology (EGEP, 2005) (Nielsen, 2005)

d. USA: VMM (Rachlin & Marshall, 2002a; 2002b) (Drumm, 2003) (BAH, 2003), CTG/SAP Public RoI (Cresswell et al., 2006) (Cresswell, 2004), Iowa RoI program (Huston & Gillispie, 2009), RoI from IT (OIG, 2009), egovernment performance measures and measurement of IBM Center for the Business of Government's withy budget focus (Stowers, 2004) (Breul et al., 2007), specifically linking budget execution and performance (Breul & Moravitz, 2006);

e. Australia: the Australian DVAM (AGIMO, 2004), later ICTBCG (AGIMO, 2008), Western Australian Office of e-Government better practices framework including guidelines (OeG, 2009a; 2009b) and checklists (OeG, 2008b; 2008c) and;

f. Others: growth accounting and economic development (Ramlan et al., 2007) (Kamel et al., 2009), IT Investment Opportunities Matrix (Lucas, 2004), outcome management in Canada, CBA in Norway,

South Africa (Esselaar et al., 2002), IT enabled government transformation (Furst, 2006);

4. **Public Value**: The Green Book (HM Treasury, 2009), The Magenta Book (HM Treasury, 2008b), Scottish Public Finance Manual (Scottish Government, 2009) Northern Ireland Guide to Expenditure Appraisal and Evaluation (Department of Finance and Personnel, 2008), Transforming Public Services (Melford, 2005), Accenture's Public Sector Value Model (Younger & Coughlin, 2004) (AGIMO, 2004) (Finnegan, 2003) (Milack & Rettie, 2006) (Accenture, 1998-2001) (Jupp & Younger, 2004), PV scorecard (Moore, 1995; 2002), The Work Foundation (Collins, 2007) (Horner et al., 2007) (Hills & Sullivan, 2006) (Cowling, 2006) (Coats & Passmore, 2008), BBC (BBC - Trust, 2008) (NAO, 2005), UK applications (Horner et al., 2007), PV of IT (Di Maio, 2007), perception of value externally (Kelly & Muers, 2002), cultural value (Holden, 2004), PV Framework for Enterprise Applications (Prakash et al., 2008), Turkish MoF SMM and the PFMVS (Guclu, 2006-2008; 2006) (MOF, 2009b; 2009c) (Stratek, 2008) (BIMSA & Palladium ES Group, 2007), economic assessment of spending and investment, and policy evaluation (HM Treasury, 2009; 2008a);

5. **IS Audit and Governance**: multidisciplinary approaches, specifically by the GAO, NAO, and ANAO (GAO, 2004a; 2004b; 2005; 2006; 2009) (ANAO, 2004; 2008; 2009), COSO based internal audit (Applegate & Wills, 1999), combined COBIT & GQM (Nicho & Cusack, 2007), Indian Office of the Comptroller and Auditor General (OCAGI, 2002), ISACA's IS Standards, Guidelines and Procedures for Auditing and Control Professionals (ISACA, 2009), ITGI's IT governance approach (ITGI, 2000-2009) (PWC, 2004) (Buckby et al., 2009) with complementing COBIT (ISACA, 2000-2009), ValIT (ISACA, 2009c), and RiskIT (ITGI, 2009a) frameworks;

6. **Capitals**: Business IQ (Sandvik & Lie-Nielsen, 2008), Enterprise Capital Model (Saint-Onge & Armstrong, 2004), IC Monitor (Nordic Industrial

Fund, 2003), IC Rating (Intellectual Capital Sweden, 1997-2009) (Value Based Management net, 2009), IC Reporting (Danish Agency for Trade and Industry, 1999) (Nielsen et al., 2008), Invisible Balance Sheet (Sveiby, 1996, 1997, 2001), Knowledge Audit Cycle (Schiuma & Marr, 2001), Measuring and Accounting Intellectual Capital (MAGIC) (Magic, 2009), Skandia Navigator (Edvinsson & Malone, 1997), Value Networks (Allee, 2003), APQC Performance (APQC, 1994-2009; 2009), Intellectual Capital Reporting (Nielsen et al., 2008);

7. **Intangibles**: Konrad Group (Sveiby, 1987 – 1989), Intangible Assets Monitor (Sveiby, 1996, 1997, 2001), Intangible Assets Measurement (Sveiby, 1996, 2001), Intangibles Scoreboard (Lev, 2001), Intangible Value Framework (Allee, 2003), Intangibles Valuation (Sullivan, 2000), EPO's IPScore (EPO, 2009), Value Dynamics (Boulton et al., 2000), Intangible Capital Value of ICT Investments (Binney et al., 2007), Valuing Intellectual Property (Sullivan, 2006);

8. **Other specific works**: business value of semantics, Semantic Interoperability Community of Practice (SICOP, 2006) (Baacke et al., 2008), Sullivan (Sullivan, 2006), health and education (Wagner et al., 2005) (UNESCO, 2003), structured eMentoring model (Rickard, 2007), software related QEST and LIME (Buglione & Abran, 2008), value contribution to SMEs (Costello et al., 2007), Spanish EIS (Roldán & Leal, 2003), public e-Procurement success (Vaidya, 2007), maintenance performance measurement (Parida, 2006), housing development process (Lindfors, 2003), contingency theory based approach (Myers, 2003), eBusiness models (Bruning, 2005), IT Portfolio Management (Cameron, 2005) , Enterprise Architecture RoI (Rico, 2006), Chabrow proposal of new metrics (Chabrow, 2006), process based PB-ISAM (Özkan, 2006; 2008), web focused SEWISS (Tokdemir, 2009);

9. **Related Standards**: The voluntary Australian Standard AS8015-2005 (Standards Australia, 2005), the new standard IS0/IEC 38500:2008 (ISO/IEC, 2008), ISO/IEC 27001 and 27002 (ISO/IEC, 2005), ISO/IEC

12207 (ISO/IEC, 2004), ISO 15504-4:2004 (ISO/IEC, 2004), ITIL (OGC, 2005), ITSM (ITSM, 2007) and CMMI (SEI, 2007);

10. **Consolidation and comparison studies**: Eleven years of work on IT Evaluation (Berghout & Remenyi, 2005), research on intellectual capital (Tan et al., 2008), quality costing approaches (Schiffauerova & Thomson, 2006), Measuring Intangible Assets (Sveiby, 2007), PV of IT (Di Maio, 2007).

CHAPTER III

PROBLEM DEFINITION

3.1. Evaluation of and the Findings from the Literature

Findings from the literature examined in Chapter 2 can be summarized as:

1. Huge sums are invested in IT, which have not really served organizations' business strategies as effectively as expected. Therefore, there is a need to justify IS expenditure by examining its contribution to achieving organizational goals;
2. There is yet no holistic approach on assessing the value and effectiveness of ICT;
3. There is no unified model with individual and aggregate indices;
4. There is a gap in research for the public sector;
5. ICT should be considered part of the overall IS and assessment should not be limited to economic returns, especially in public sector;
6. Most of the findings are generally derived from developed countries, which cannot be generalized to cover fundamentally variant political, economic, social, and cultural characteristics;

7. It is essential to develop a unified adaptive and time-variant model for the assessment of the effectiveness of ICT, taking into account both tangible and intangible values; both direct and indirect measurements. This is particularly applicable to the public sector as the value in public investments drain more public resources provided through citizens' time for integration of value delivery processes and are hard to calculate in currency;
8. An assessment model covering, ex-ante (for selection of initiatives), ex-post (for deriving lessons and comparisons), and future evaluation independent of IS type should be developed;
9. IS has to be aligned with business goals and objectives, requiring impact assessment covering the achievements as defined in the SP;
10. Effectiveness has to be linked with PV, through public expenditure both from goals identified in the SP to the budgeting, and from expenditure back to the fulfilment of the state's goals and targets;
11. Measurements should take into account direct citizen value, non-direct social value, government operational / foundational value, government financial value, and strategic / political value; and
12. Multidimensional models are used with a mix of quantitative and qualitative measures, and the benefits/impacts are generally measured through subjective mechanisms; hence the mechanisms of continuous data collection and analysis directly from operational systems have to be introduced to reduce subjectivity.

Common points related with the definition of value can be derived as in Equations (2) and (3).

One missing or implicit component in all of these approaches is the value associated with one of the most vulnerable entities as repeatedly have been seen in the near past, namely the Environment. The definitions mentioned above can all be merged in proposed value definition. PV in this context can be investigated in five levels as defined on the PV delivery chain shown in Figure 2:

1. Agency Value, described as direct organizational or financial (monetary savings) value to the service provider;
2. User Value, related with citizen expectations fulfilment and direct financial values, measured in terms of time and cost;
3. Political Value, described in terms of trust to the government, and financial gains;
4. Strategic/social Value, in terms of overall value to the community, measured in terms of outcomes and impacts; and last but not the least
5. Environment Value, described in terms of specific impact of the initiatives on the environment, extending the classical 3E paradigm of Economy, Efficiency and Effectives to 4E with the addition of Environment.

The outcome, then, is the Result, which can be represented as *f(value, cost, risk)* as correctly captured and taken into account in all international models.

Similarly, impact is the longer term effect of the implementation of the government policies on the public at large.

In the PV chain, each service is delivered through one or more processes and the beneficiary's expectation is expressed in terms of value for money, namely the tax paid or payment for the services. The relationship between the service and the process is defined in the ontology model given in *Section 4.4. Ontology*. Similarly, within the process framework of SMM, the 3E rule of government, which can be found even in legislation, can be defined as follows;

Economy = Activities / Inputs Equation (7)

Economy aims at generating more work with fewer resources.

Efficiency = Value_Outputs / Value_Inputs Equation (8)

Efficiency is the ratio of the effective or useful output to the total input in any system.

Effectiveness = Goals_Achieved - Goals_Planned Equation (9)

Effectiveness can also be represented as (realized_outcomes - planned_outcomes); i.e. the success of the resources used in achieving the objectives set. Effectiveness is a measure of the extent to which a project, program or policy achieves its objectives, which triggers us to look for answers to questions such as "Are there better ways to achieve this objective?" and "Are there better uses for these resources? ". However, this requires translating qualitative expressions into monetary ones, or applying principles of Social Return on Investment (Cabinet Office, 2009).

3.2. Public Value and Strategic Management Model

Effectiveness in public sector needs to be built on the concept of PV which should incorporate both monetary and non-monetary benefits.

PV can be defined as the value delivered to the public at large, through a set of well-planned activities of government agencies, funded by tax-payers. It is the outcome and the impact of the process value chain.

Figure 2 represents the process and services that generate PV in a generic sense.

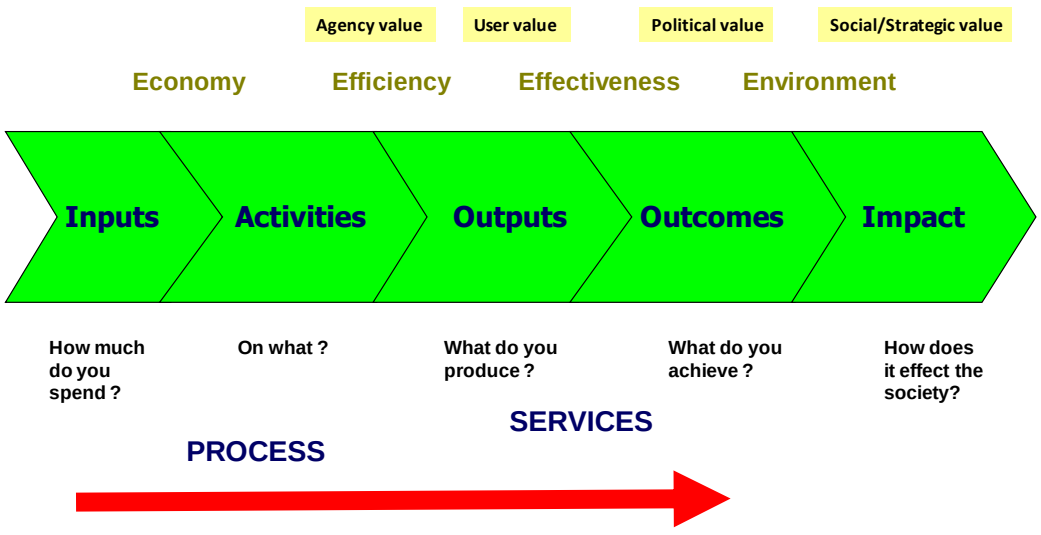

Figure 2. Process, Services and Public Value

Each government service provided to the public is delivered through one or more processes and the beneficiary's expectation is expressed in terms of value for money, namely the tax paid or payment for the services.

The points captured and criticized in the previous Chapter can be merged in proposed value definition. Multiple values have been defined taking into account the major stakeholders, propose a method for calculation of indices for each value category, and a single composite index as the Total Public Value (TPV) delivered, representing the success/impact based on proximity of achievements against the SP of the agency, using a hierarchical decomposition of indicators.

PV in SMM and PFMVS context can be investigated in five value categories:

1. Agency Value: described as direct organizational or financial (monetary savings) value to the service provider; measured in terms of productivity, savings through technology, alignment with macro policies;
2. User Value: related with citizen expectations fulfilment and direct financial values; measured in terms of time and cost, improved qualifications, better jobs, availability and accessibility of government services;
3. Political Value: described in terms of trust to the government, and financial gains; measured in terms of reduced unemployment, citizen satisfaction, improved education, improved wellbeing, improved perception of government services;
4. Strategic/Social Value: in terms of overall value to the community, measured in terms of outcomes and impacts, and improved social cohesion; and
5. Environment Value: described in terms of specific impact of the initiatives on the environment, extending the classical 3E paradigm of Economy, Efficiency and Effectives to 4E with the addition of Environment.

These value categories are mapped to constructs of existing models and frameworks as follows:

Table 4. Comparison of SMM Value Categories with Constructs of Widely-discussed Assessment Models

SMM value categories	**Mapping to existing models/frameworks**				
	D&M	**Revised D&M**	**BSC**	**BSC – public**	**IS-Impact**
Agency Value	Information Quality, System Quality, Organization Impact	Information Quality, System Quality, Service Quality (implicit), Net Benefits with organizations, and nations	Financial, Internal Process, Learning and Growth	Internal Process, Learning and Growth	Information Quality, System Quality
User Value	Individual Impact, Use, User Satisfaction	Intention to Use, Use, User Satisfaction, Net Benefits with individuals, groups, industries	Financial, Customer	Financial and social costs, Customers and constituents	Individual Impact
Political Value	Individual and Organizational Impact (indirectly)	Net Benefits (indirectly)	Financial (indirectly), Customer	Financial and social costs, Customers and constituents	Organizational Impact (indirectly)
Strategic/Social Value	None	Net Benefits with nations	Customer	Customers and constituents	Organizational Impact (indirectly)
Environment Value	None	None	None	None	None
Total Public Value	Individual Impact, Organization Impact (partially)	Net Benefits (revised D&M Model)	None	None	IS success index

SMM takes the strategy-business-IT alignment approach, with multiple stakeholder categories mapping to value categories. The agency performance P will be reported in the Annual Accountability Report and be based on achievement of all goals, as

$$P = \sum_i \mathrm{P}_i, \qquad \text{Equation (10)}$$

where P_i is the performance value of G_i (achievement factor of goal i).

Moreover, linking the expenditure on ICT assets and strategic goals with the existing Government Finance Statistics (GFS) (IMF, 2001) framework of organizational, functional, economic, financial and revenue taxonomies, as applied in building PFMVS, allows for not to losing financial control perspective in order to trace the cost of the investment and current expenditure on each project and activity; and hence related process and service; through projecting the values and weighted calculation of the summation of the expenditure on the Strategic Goal axis. Finally each service delivery cycle, which is a process instance, can be costed and associated with achieving the cost of measurable objectives. This includes any expenditure, from staff payroll to ICT, from project specific investments (capital expenditure) to distributed fixed operational costs (current expenditure).

3.3. Expected Results

In this thesis, a specific approach developed for measuring both direct and indirect benefits as Agency Value, User Value, Political Value, Strategic/Social Value, and Environment Value will be developed for evaluating effectiveness of information systems in the public sector. A calculation method for both different indices for these values and the combined index, called the Total Public Value will be developed.

It will be shown that the SMM is based on and an extensive expansion of GFS, which the public finance officers are familiar with, introducing simplification over complex and chaotic public financial management environment.

The developed Value Space is expected to provide for multiple perspectives such as organizational, functional, and performance with the same set of values, by fixing related dimensions under analysis.

With the extension of assessment model, budget component will be associated with effectiveness, taking into account the economy and efficiency factors, in addition to effectiveness.

The model will be partially validated through two case studies of IS investments at the MoF.

CHAPTER IV

STRATEGIC MANAGEMENT MODEL, VALUE SPACE AND THE ASSESSMENT

4.1. General Framework

The SMM is based on TNKM approach (Firestone & McElroy, 2003), and extends the TNKM with process and semantic integration as depicted in Figure 3:

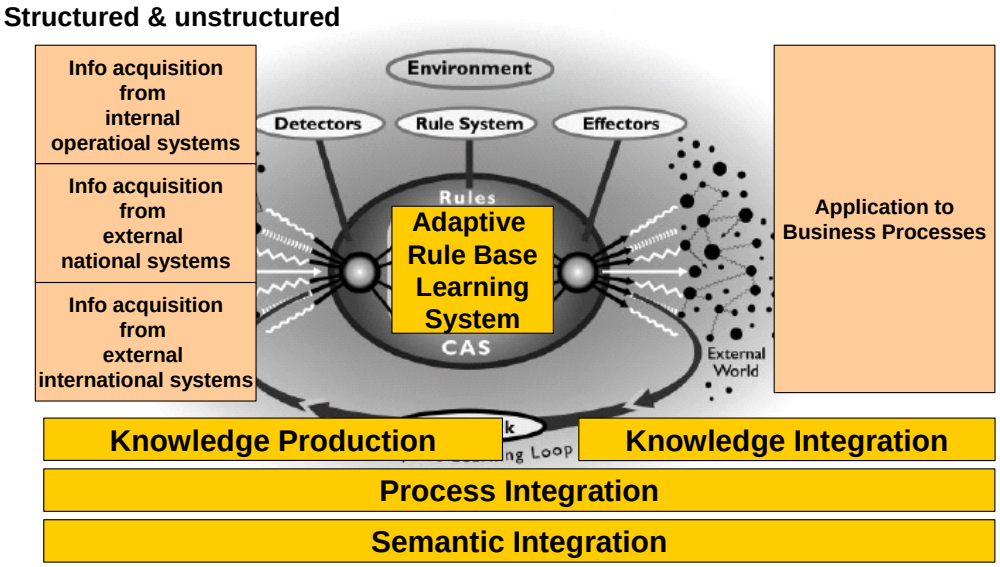

Figure 3. The Extended New Knowledge Management Model

In the TNKM framework, the stimuli to SMM are the information acquired through internal operational systems as well as external national and international systems. Based on this information, the SP is developed. The operational priorities and selection of initiatives to be supported are to be handled via an adaptive rule base system, capable of learning, which is not the focus of this research. This can be applied to business processes.

The first part of developing the plans are related with knowledge production, and sharing the plans and internalization are related with knowledge integration within the agency. Process integration is provided through a streamlined process design for the value delivery based on extended Event Driven Process Chains (Scheer, 2010) and semantic integration is provided through Services Ontology based on a common controlled vocabulary, which will briefly discussed in *Section 4.4. Ontology*.

The resulting SMM is as given in Figure 4 (Guclu & Bilgen, 2010):

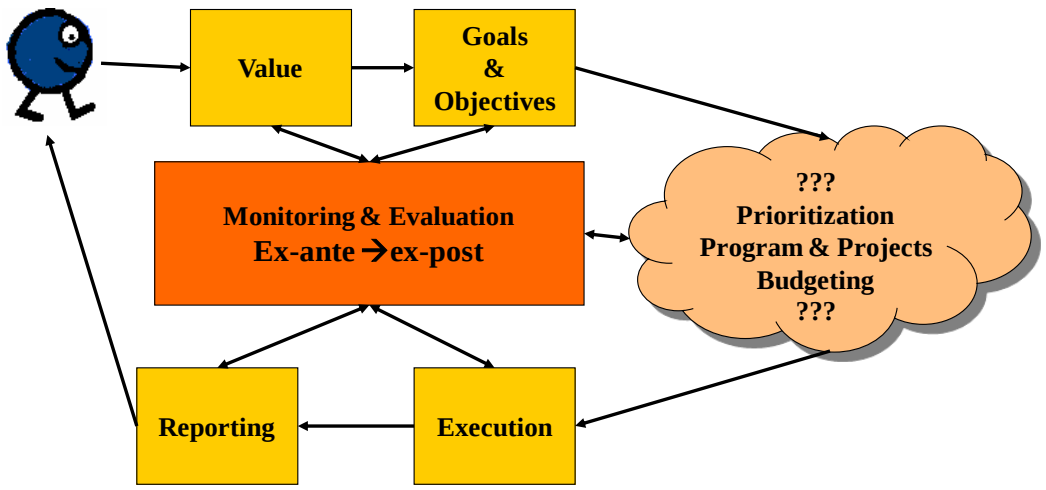

Figure 4. Strategic Management Lifecycle at the Ministry of Finance

Important points to mention here are:

1 The SMM starts with the Value concept, rather than the traditional engineering approach of inputs.

2 In the SMM, the lifecycle has been designed as a Deming-like (Deming, 1986) continuous process model.

3 Evaluation is shifted from ex-ante compliance controls to a-posteriori effectiveness assessment.

Assessment for the investments is not a one-time activity, but a continuous process of monitoring and evaluation, and hence is embedded as a parallel process throughout the life cycle; in which there is a two way feedback and control mechanism at each step of the execution.

The PFMVS described below is adopted as the implementation paradigm for SMM.

4.2. Step-by-step Construction of the Value Space

SMM implementation requires linking budget execution (spending) to goals. The defined dimensions based on the entities in Figure 5 enable the operational staff and managers to trace expenditure to measurable goals. The VS is an extensive expansion of the modified GFS classification (IMF, 2001) for Economic, Functional, and Organizational dimensions. In this section, SMM approach will be clarified with examples from the MoF.

The main characteristics of the VS are as follows:

1. A taxonomy in PFM is a set of enumerated values. Each taxonomy is represented as a dimension in the PFMVS. Hence, dimensions of the VS are not linear, and any value on any dimension is an element of the related taxonomy.

   Each taxonomy also corresponds to a class definition; hence each element of the set (an enumerated value) is an entity instance of the corresponding class. For the example of Functional Classification, the element “01 General public services” is an instance of the Functional class. Entity instances are consequently defined as disjoint enumerated sets. These have recursive property, as there can

be further segmentation of a set entity into further breakdown, which in turn becomes a set within a set. Each highest level classification is also called a "segment". Each of these breakdowns of a segment is called a "level"; hence a segment can be represented as L1.L2.L3…Ln. There is no limit on the number of sets within each highest level set, represented as a taxonomy, synonymously a dimension, synonymously a class.

For example, the elements of the set Functional Classification are {"01 General public services", "02 Defense", "05 Environment", "07 Health", "09 Education"}, and so on as the first level L1.

Each element is regarded as a subclass, and can be further broken down into lower level classifications; hence each element can also be represented as a smaller VS.

For example, {"01 General public services"} can be further broken down as {"Financial services"}, again to {"Public Financial Management"}, and to {"Accounting"}, as level 2, L2.

A typical representation then becomes General_Public_Services**.**Financial_Services**.** Public_Financial_Management**.**Accounting. With this description General_Public_Services is L1, Financial_Services is L2, Public_Financial_Management is L3, and Accounting is L4. The representation for "Accounting" is then L1.L2.L3.L4.

While each dimension of the VS corresponds to a taxonomy, the overall VS defines the ICT value assessment ontology, considering the entities, rules and relations between the entities.

2. The first step in constructing the PFMVS is to use the GFS (modified by the MoF, Turkey, and put into legislation in 2003) Functional, Economic, Organizational (sometimes also called as Administrative), Financing segments as classifications, by converting each classification (segment) into one dimension for Budget Management, focusing on Expenditure. The dimensions of this preliminary VS are:

i. **Organizational classification.** This represents the organizational structure, and a typical example will be MoF.GD_of_Accounting.MIS_Department.

ii. **Functional classification**. This represents the functional taxonomy, and includes main sectors of public funds allocation and spending, such as "General Public Services", "Education", "Health", and "Defense".

A similar segmentation to each one of these instances has been applied. For example, "General Public Services" includes "Financial Services", which includes "Public Financial Management", which is a set of {"Funds and Debt Management", "Taxation Policies Management", "Budgeting", "Accounting", "Control and Audit", and "Public Information Services Related to Evaluation and Improvement of Financial Services"}.

In the Turkish case, the subclassification of L5 onwards can be used by agency specific initiatives, however, defining a separate dimension for Services, will allow for cross-agency comparison of investment/operational effectiveness, and hence is recommended for the new model.

iii. **Economic classification**. This classification is also based on GFS and is being used country wide. The set has elements such as "Personnel", "Goods and Services", and "Investments".

To give further examples, some of the first level (L1) entities of this segment are {"01 Personnel", "03 Goods & Services", "06 Investment"}, which correspond to one dimension in PFMVS.

Some of the L1-L4 entities are, "01.1 Civil Servants", "01.2 Contracted Personnel", "03.1 Procurement of Goods & Services for Production", "03.4 Travel Expenses", "03.5 Service Procurement", "03.5.1 Consultancy", "03.5.2 Communication Expenses", "03.5.3 Transportation", "03.5.4 Regular Bills", "03.5.5 Rent", "03.7 Moveables Maintenance and Service", "03.8 Property Maintenance and Service", "06.1 Goods", "06.1.2 Office Equipment", "06.1.2.01 Office Equipment", "06.1.2.02 Computer", "06.3.1 Software", "06.3.3 License", "06.6.6.09 Computer and Computer Systems

Rental". The full list of all these classifications are given at the web sites of the MoF.

The elements mentioned above also constitute the "cost" items of IS investments and operational spending. The first level (L1) entities are {"01 Personnel", "03 Goods & Services", "06 Investment"}, covering current expenditure for ICT assets. L1-L4 segment entities used in calculating the cost of ICT are given by the set:

C1={"01.1 Civil Servants", "01.2 Contracted Personnel", "03.1 Procurement of Goods & Services for Production", "03.4 Travel Expenses", "03.5 Service Procurement", "03.5.1 Consultancy", "03.5.2 Communication Expenses", "03.5.3 Transportation", "03.5.4 Regular Bills", "03.5.5 Rent", "03.7 Moveables Maintenance and Service", "03.8 Property Maintenance and Service", "06.1 Goods", "06.1.2 Office Equipment", "06.1.2.01 Office Equipment", "06.1.2.02 Computer", "06.3.1 Software", "06.3.3 License", "06.6.6.09 Computer and Computer Systems Rental"}.

Any expenditure value can be represented as a node in the VS and can be projected onto one of the above-mentioned dimensions to find out its relevance to the associated segments. Hence, an expenditure can be represented as an n-tuple of instance values on each dimension. For example, salary payments will have the projection on "01 Personnel" in the Economic dimension, and to related sector in Functional dimension, etc.

iv. **Financing classification**. This classification specifies financing resources, and the overall set covers various funding sources such as national budget, international agency loans (such as the World Bank and IMF), etc.

The GFS classification can be summarized in Figure 5.

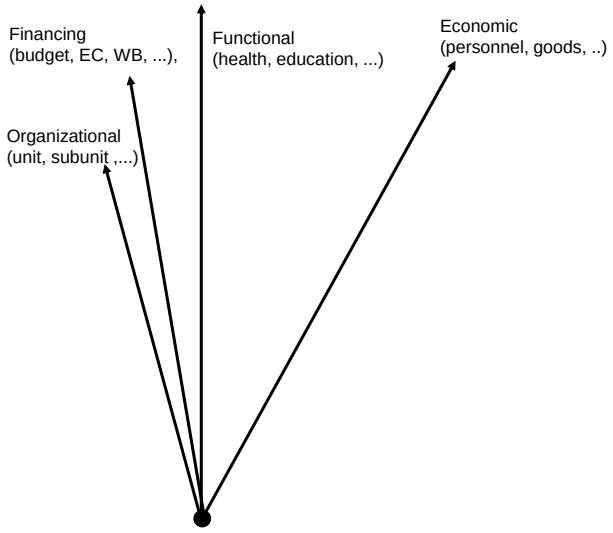

Figure 5. Public Financial Management (Budget) Expenditure Space

The following rules apply to the GFS based VS:

- Each classification, which is called a segment within GFS terminology, consists of an enumerated set of disjoint values.
- Each element within any classification comprises a further breakdown into another set of disjoint value set.
- These breakdowns constitute a hierarchical representation of classes and subclasses, hence each classification corresponds to a class with subclasses. Each element of the set, which is an enumerated value, is also an entity instance of the corresponding class.
- These levels in sub-classification are represented as L1.L2.L3…Ln where L is the level of breakdown and generally the countries do not go beyond the 4^{th} level.
- Each classification (segment) is then converted into one dimension of the Value Space (VS) as they are disjoint sets.
- These dimensions constitute the basis for the PFMVS.

- Each element with sub-classification can also be represented as a smaller VS, representing the recursive property of set within a set.
- Within this basic PFMVS, any 4-tuple represents the public expenditure. A corresponding value on any one of these dimensions clearly describes the nature of the expenditure, namely which organization it belongs to, for which function it is used, the type and the funding source of the expenditure.
- While each dimension of the VS corresponds to a taxonomy, the overall VS defines the expenditure ontology, considering the entities, rules and relations between the entities.
- This approach allows us to extend the VS with any number of extra dimensions for further association of concepts within the same framework.

3. The second step is to extend the preliminary PFMVS, by adding two new dimensions appearing as new segments in Budget Management. The new dimensions are:

   v. **Geographical classification**. This may be implicitly embedded within the Organization classification of the Budget, however, it is in general preferable to have a separate taxonomy to enable location based assessment, and comparisons. Especially in the case of de-centralized budget management, this new segment would be used.

      In the Turkish example, either the list of 81 provinces or the State Planning Office classification for "priority development regions" can be used in this dimension.

   vi. **Program classification.** This dimension includes projects and activities (initiatives); and is sometimes used in Budget Management Systems as Medium Term Expenditure Framework related classification (World Bank, 1997-2010).

      It has been introduced recently as part of Performance Based Budgeting (PBB) approach in Turkey. Some typical examples are the "SGB-Net SMM IS", which is a series of related projects designed to support the same

objective, “eButce Budget Management”, and “Say2000i the Public Accounting”. A program may serve for more than one Objective. For example, SGB-Net serves G1, G2, and G5.

4. The third step is to extend the PFMVS further, by adding two new dimensions, capturing the revenues and accounting, which are:

vii. **Revenue classification**. This classification is designed by the Revenue Administration in the country and is to be used country wide. The classification is closely linked with the administrative structure of the country, and generally focuses on the taxes. In countries with federative structures, there are both global and local/provincial taxes; in more centralized countries, there are more global taxes. Some of the tax items are direct, such as over corporate/personal income, some are indirect, such as embedded within the price of the fuel as VAT and additional special taxes. For example, in Turkey, a typical L1.L2.L3 classification would be Indirect_Taxes.Fees.Certification_Fees.

viii. **Accounting classification**. This taxonomy is also known as the Unified Chart of Accounts and can be integrated with Budget classification. However, in the case of financial management processes of the MoF, this can be taken as a separate taxonomy. All expenditure items are transferred to the General Ledger through mapping tables.

In Turkey, the cost items of “03 Goods & Services” of the Expenditure classification are given as

> C2= {“920.01.06.03.01 Software”, “255.02 Office Equipment”, “255.02.01 Computers and Servers”, “255.02.02 Peripherals”, “255.02.03 Photocopiers”, “255.02.04 Communications Equipment”, “255.02.05 Audio, Visual, Presentation”, “258.90.06.03.03 Licenses”, “280.03.05.05.10 Computer, Computer Systems and Software Rental”, “322.03.05.01.03 Computer Services Procurement”}.

5. The fourth and the final extensions to the PFMVS consist of two new dimensions, capturing the revenues and accounting. These new dimensions are directly related with Performance Management concepts, covering Goals & Objectives, Resources, Services, Policies Resources and Risks. The following classifications are further extensions of GFS, and constitute a new model for performance management at the MoF.

   ix. **Goals and objectives classification.** This is a set defined within the SP. Goals and objectives dimension is a set of goals {G1, ..., Gn} that the agency plans to achieve by the end of the strategic planning period.

   Within the scope of this research, instead of differentiating between more abstract goals and measurable objectives, in which every goal is actually represented by a set of objectives, these terms will be used interchangeably. Therefore, each goal/objective must be measurable, and has certain values assigned for each year. The agency requires and justifies the budget based on the achievement level set for each goal. This expected and planned level is to be measurable through KGIs and KPIs, discussed in *Section 4.3. Key Goal and Performance Indicators.*

   The SP starts with a Vision statement. The vision can be hierarchically broken down into Themes, Themes into Strategic Goals, and Goals into Strategic Objectives; then further down to Directorate Objectives, Unit Objectives, and finally the Strategies. This is the baseline for the plan.

   Each one of the defined goals has a set of attributes. The objectives set can be regarded either as a second level of classification (L2) or one of the attributes of a particular goal. The objectives represent a set of outcomes expected to be achieved in order to achieve that particular goal. For each goal Gi, there is a set of goal/outcome indicators KGI = sum (weighted KPIs), and for each outcome, there is a set of performance indicators (KPIs). Similarly, for each KPI, there exists a set of metrics KPI = sum (weighted metrics).

   For each project or activity in the Program dimension, which have been designed to support objectives, there exist a set of associated KPIs. All

projects are assumed to be defined with relative impact percentage on designated objectives. An objective may be supported by restructuring (of process and organization) in addition to the IT projects. Moreover, a project may support more than one objective.

KGI (measure) KGI_{ij} is a performance measure (the j^{th} measure) related to goal i, G_i. For each measure, there is the planned (expected) and realized (achieved) values, set in the SP. If $KGI_{ij}(p)$ is the j^{th} planned measure for G_i, $KGI_{ij}(r)$ will be the j^{th} realized measure for G_i. If KPI related to measure j (KGI_{ij}) of G_i is considered, W_{ijk} is taken as the weight of measure j related to goal i, then this will be represented as KPI_{ijk} , which is also a KPI associated with a particular initiative, then

$$KGI_{ij} = \sum_k W_{ijk}\, KPI_{ijk}. \qquad \text{Equation (11)}$$

The weights W_{ijk} can be determined through budget load, which is the ratio of budget required to achieve that particular KPI, or through AHP method. If no explicit value specified, it can be calculated as the arithmetic distribution, 100 / number of measures.

The dependencies/constraints can also be calculated as a weighted summation of

(Agency, User, Political, Strategic/Social, Environmental) OR

(Organisational, Government, Community, Financial) OR

(User, Social, Government, Financial, Strategic) benefits

This approach allows us to combine all different models in a single calculation, with the inclusion of the assessment of the value for the environmental impact.

x. **Services classification.** Services include processes, which are directly related with the value delivery incorporating all five value categories mentioned in *Section 3.2. Public Value and Strategic Management Model.*

A service consists of one or more Business Processes. A business process is a series of Processes. Processes can be decomposed into Business Functions, and Functions into Tasks. This is a typical breakdown used in extended Event Driven Process Chain method.

For example of MoF, the set of services are categorized as primary and subsidiary as explained under *Chapter 5. The Case of Turkey*.

xi. **Policies classification.** Policies include regulations & procedures. Typical example is "Public Financial Management and Control Law No 5018" (MOF 2009c) on which the SMM is based on. Policies, based on the vision, can be represented as a set of Regulations, which in turn reflect themselves on Procedures for daily operations.

xii. **Tangible Resources classification** including ICT assets. There are three types of tangible resources, personnel (quantity), immovable assets (ICT) and moveable assets (ICT). The asset classification is developed as 5 segments, and the complete set of moveable assets of government of Turkey can be found in (Prime Ministry, 2007) as part of legislation.

xiii. **Intangible Resources classification** including human resources skills. There are two types of intangible resources, namely the human resources and organizational knowledge. Sveiby presents (Sveiby, 2007) various methods of measuring intangible assets. The literature suggests that human resources qualifications including skill-base and organizational knowledge should be considered as separate value drivers. AHP can be applied to sort these non-financial value drivers in order according to their weighted contributions.

xiv. **Risks classification**. Risks associated with the PV function defined in *Section 4.6. The Value Space and the Effectiveness Assessment*, are also described as a set. Each risk entity has the attributes of type (COSO, 2004) (ISACA, 2009b) (ISO, 2009), likelihood, impact level, risk factor (likelihood * impact level), and mitigation (avoidance, reduction, sharing, retention).

The resulting extended PFMVS is depicted in Figure 6, with all dimensions discussed above. Extensions on original GFS are represented in **red**.

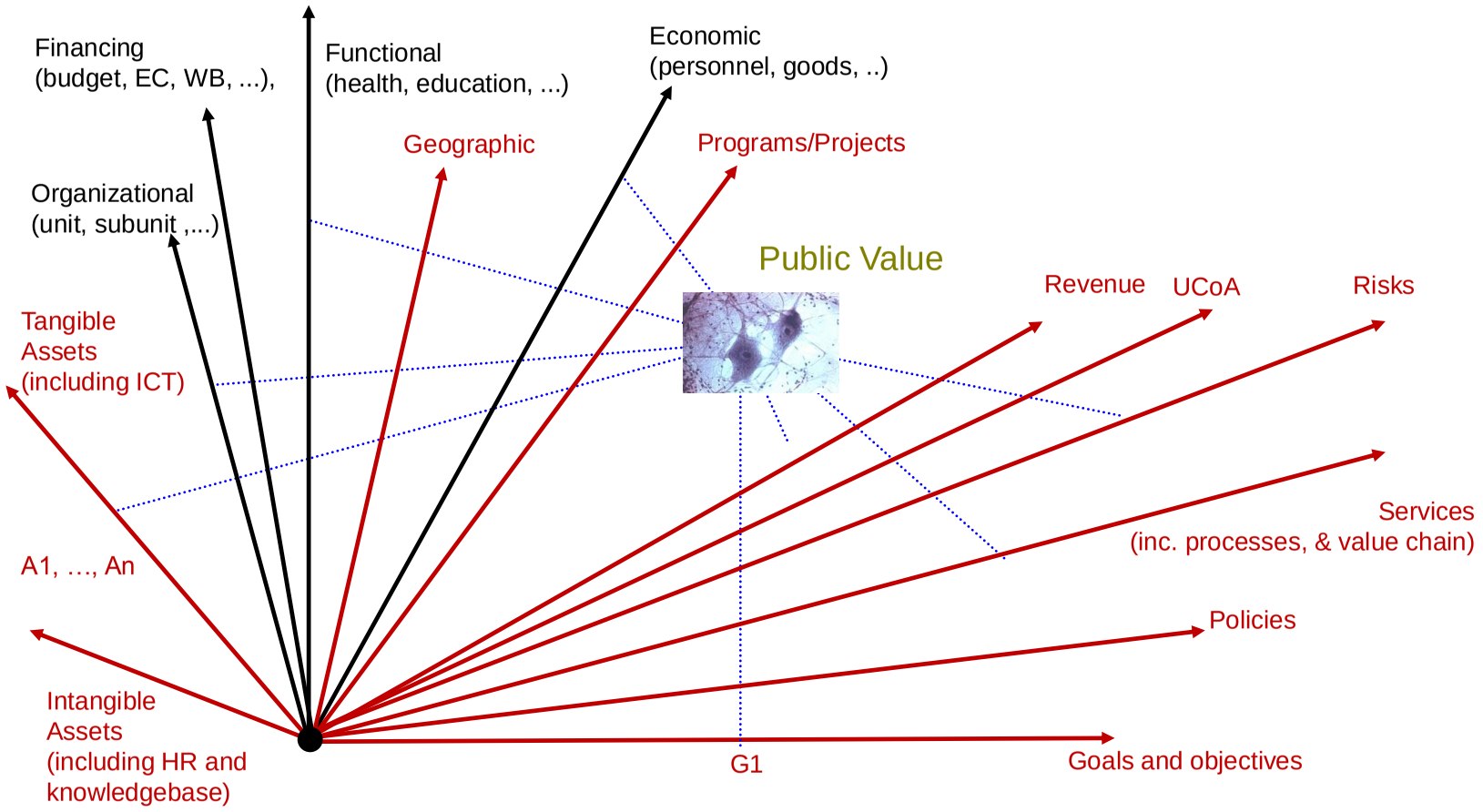

Figure 6. Public Financial Management Value Space

6. Any PV is an n-tuple in the PFMVS, and a value of the i^{th} element of the tuple is the value of the corresponding set element on the i^{th} dimension; such as "PV is delivered by the organization MoF", "serving Objective2.1", etc. Similarly, PV can be associated with a set of values. For example, there may be more than one corresponding set element on the Economic dimension if the cost includes goods, services, and personnel. There may be more than one associated element on the Financing dimension, if there is more than one source of funds, such as funding provided partially by the national budget and partially by the EU. Total coverage of Geographic dimension (complete set) applies for values delivered regardless of specific region. If more than one objective is satisfied through synergy creation project, which is discussed in *Section 4.6. The Value Space and the Effectiveness Assessment*. Similarly various resources may be utilized for the delivery of the PV, meaning there is more than one associated set element on the dimensions Tangible Resources and Intangible Resources.

When the PFMVS is mapped into PFM Ontology, each dimension in the VS corresponds to a class, and each instance of the class corresponds to an enumerated value within the classification set. These classes are then linked together in an ontological model for semantic integration, mapping the PFMVS to PFM ontology.

4.3. Key Goal and Performance Indicators

Effectiveness indicators are related directly with the KGIs, which are directly aligned with government goals and objectives for benefits realization. These indicators will focus on appearance, timeliness, responsiveness, reliability, dependability, performance, accuracy; of the product, service, or staff. Each KGI can be defined as a weighted sum of KPIs.

All assessment efforts should be built on the SP of the agency. Each and every agency develops a SP for a period of five years. Within the SP, the agency defines goals and objectives in line with the value to be delivered to the beneficiaries (G2C for citizens, G2G for other government agencies, G2B for businesses, and G2E for its employees). The SP is to be based on government level policy papers, and hence has to be in line with policy requirements. For each one of these 5 years, the agency

then develops the annual Operational Plan, based on the budget ceilings set by the government. The agency has to identify the initiatives (the program and the projects), prioritize and set the budget accordingly. The budget requested has to be aligned with the goals and the objectives and must be justified accordingly. To ensure that the objectives have been reached through the initiatives envisaged, the agency has to clearly identify the performance measures.

SP is defined by a set of key goals decided through policy analysis studies covering all of the five factors,

1 agency value: productivity, savings through technology, alignment with macro policies,

2 user value: improved qualifications, better jobs, availability and accessibility of government services,

3 political value: reduced unemployment, citizen satisfaction, improved education, improved wellbeing, improved perception of government services,

4 strategic/social value: improved social cohesion, and

5 environmental value: impact on the environment

as

$SP \supset \{G_i\}$. Equation (12)

The agency performance P will be reported in the Annual Accountability Report and be based on achievement of all goals, as given in Equation (10).

There must a set of measures to be defined for each G_i as KGIs (measures). Let KGI (measure) KGI_{ij} be such a performance measure (the j^{th} measure) related to goal i, G_i. For each measure, there is the planned (expected) and realized (achieved) values, set in the SP. Let $KGI_{ij}(p)$ be the j^{th} planned measure for G_i, and $KGI_{ij}(r)$ be the j^{th} realized measure for G_i.

Each KGI_{ij} can be calculated as the weighted average of KPIs (indicators). Let KPI_{ijk} be the indicator related to measure j (KGI_{ij}) of G_i, and W_{ijk} be the weight of

measure j related to goal i (if no value specified, it is calculated as the arithmetic distribution, 100 / number of measures). Then

$$\mathrm{KGI}_{ij} = \sum_k \mathrm{W}_{ijk}\ \mathrm{KPI}_{ijk}. \qquad \text{Equation (13)}$$

If there is negative impact envisaged, the KGI can be defined as a negative value.

AGIMO defines a comprehensive list of these indicators (AGIMO, 2006), and it believed that the indicator catalogue should be maintained as a living document, adaptable to ever-changing chaotic macroeconomic environment, especially with policy making and controlling agencies like the MoF. A careful study of the list presented by AGIMO shows that, not only effectiveness but also efficiency indicators are captured as well. The list of indicators cover the UK, Australia, and US models; and the reflection on SMM can be elaborated as follows:

1 KGIs (measures)

   a) After the fact outcomes from an ICT project cover the effectiveness indicators related mostly with agency and user values. The level of increase in performance management, level of reduction in IT risks, level of increase in productivity, level of increase in the supply chain integration, level of compliance with standards, and the level of standardization are related with the agency value. The level of service delivery, level of reach to target users, satisfaction level, and the new channels are related with the user value. Finally, the measure of RoI (or social RoI) is related with strategic-social value.

   b) Indicators of Alignment of ICT Investment with Government Business Objectives correspond directly to the agency value.

   c) Indicators for Benefits Realization correspond to the political value.

   d) Investment effectiveness of Enterprise ICT and ICT Management correspond to user and agency values.

2 KPIs (indicators): breakdown of KGIs into lower level indicators of quality and quantity, also allowing us to link effectiveness with efficiency and economy.

3 Metrics – further breakdown of KPIs into activities.

Indicators used in the MoF cases are presented in Sections *5.2. Case Study: Say2000i, MOF* and *5.3. Case Study: SGB-Net, MOF*.

4.4. Ontology

Ontology is the science of analysing structures of objects, properties, events, process and relations in every area of reality (Smith & Welty, 2001). Ontology in the knowledge domain means specification of conceptualization. That is, ontology is a description of the concepts and relationships that can exist for an agent or a community of agents.

Ontology models are designed to be used as a medium of knowledge sharing and reusing; together with a set of individual instances of classes (concepts), it constitutes a knowledge base. Common components of ontology models include:

- Classes: collections, concepts, kinds of things that have certain things in common
- Individuals: instances, objects, or elements of classes.
- Attributes: aspects, properties, features, characteristics, or parameters that objects (and classes) can have
- Relations: Properties, slots, ways in which classes and individuals can be related to one another

The ontology models are developed:

- to share common understanding of the structure of information among people or software agents,
- to enable reuse of domain knowledge,
- to make domain assumptions explicit
- to separate domain knowledge from the operational knowledge, and
- to analyse domain knowledge (Noy & McGuiness, 2000).

Within the context of the aforementioned descriptions, ontology model is a must for any domain of knowledge that has a wide range of contributors and agents. That's

why a concrete ontological model of government services will be a basic starting point for:

- developing a common explicit model for all government services,
- sharing the same types of methodology among all agents of public services,
- business analysis and redesign of government services in order to eliminate redundant tasks and reduce bureaucracy, which is a common problem in public services worldwide,
- establishing a concrete infrastructure for e-government applications, and
- being able to perform an impact analysis among the objects of the model, to the extent that, the administration should be able to answer questions such as what happens if an article of a certain regulation is changed, what would be the effect of this change on the processes, authorities and other classes of the public services; and what needs to be done at the organizational, data, legislative, and process levels to be able to move the service delivery channel to electronic or mobile media.

The developed Ontological Model (Sonmez et al., 2010) has 21 classes. In the determination of these classes, the nature of public services, their servicing environment, effects to the public and their representation in strategic management of public agencies were taken into account.

Each one of these classes has its own instances. For example, the service class has 950 instances, which refers to all of the public services captured in a study carried out in one local government in Turkey (Erzincan), which is a small replica of all central government institutions. In the Erzincan Pilot Project (EPP), designed service ontology has been verified through extensive field study.

The total number of relations among these 21 classes is 166, and the total number of attributes is 110. Table 5 depicts a brief outline of the ontology developed:

Table 5.The Overview of the Ontological Model

Class	# Relations	Description	Key attributes
Service	17	The name of the public service presented to the user	Type of service, medium of application for service, medium of declaration for the result, service channel, the category of service, mean time of service, total number of services per year
Regulation	6	All regulations related with service including traditional (non-legislative) ways of performing service, processes and activities	Types, number, date of acceptance, date of application, date of removal, related legislative article
Process	18	Set of functions/ activities to complete service delivery	Cycle of the process
User	3	User of the service (citizen, business, public agency, "employee)	Depending on the type of user date of birth, gender, citizenship, residency, date of death type of the business, date of foundation, date of close
Unit	3	User of the service	Type of unit, date of foundation, date of close
Plan	10	Any type of plan including strategic plan which has a relation with service	Date of start, date of end, responsible authority
Activity	12	Step of a process	Mean time to complete, average delay time, maximum and minimum times for completion
Input	6	All sorts of documents and data used during the production of the service	Type of input, main or supplementary, electronic or hard print
Output	5	All sorts of documents and data generated during execution of the process	Type of output, main or supplementary, electronic or hard print
Role_1	9	The role of authority delivering the services	Function and type of role

Table 5 (continued)

Class	# Relations	Description	Key attributes
Article of the Plan	4	Any article of any plan that has a relation with the service	The article number, chapter, associated goal, goal indicator, performance indicators, responsible authority
Article of the Regulation	5	Any article of any regulation that has a relation with the service	Type of regulation, number, article number
System	2	The system, either manual or electronic, used in the service delivery	Type of system, accessibility, interaction with other systems
Source	3	The source used in the service delivery	Type (human, IT, information, time, budget, moveable assets, fixed assets and their descriptive attributes such as amount, unit, capability)
Risk	7	Any type of event that will negatively impact service delivery or diminish the benefit of the service	Type of risk, probability of risk, impact of risk, risk mitigation
Control	7	Specific activity to check the compliance (ref. Internal Control)	Type, phases, frequency, place
Critical Success Factor	3	An element that is necessary for a service to achieve the expected result	Type, degree
Result/ Benefit	3	A clearly defined outcome	Type of benefit and result
Indicator	9	A numerical measure of the any value related with service and other or other classes	Type of indicator, minimum, maximum, value

The entities in Table 5 can also be represented as given in Figure 7:

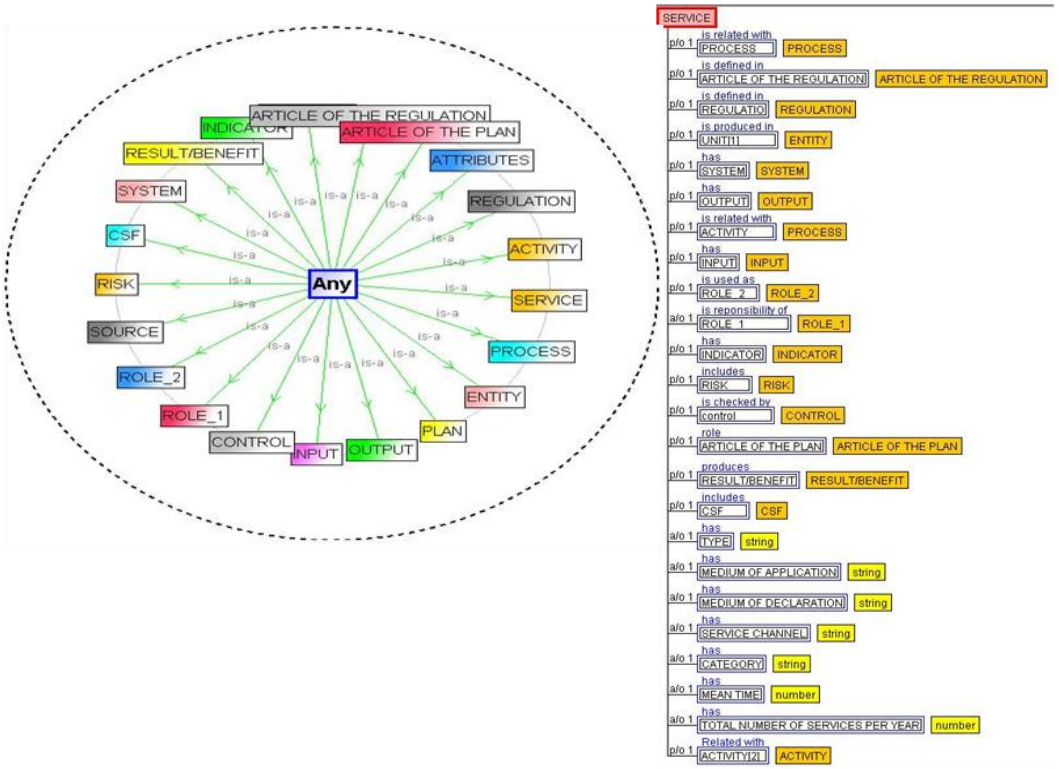

Figure 7. Classes of the Model

Since the focus is on the service delivery, a closer look at the Service Class would be appropriate. The Service class can be represented as given in Figure 8:

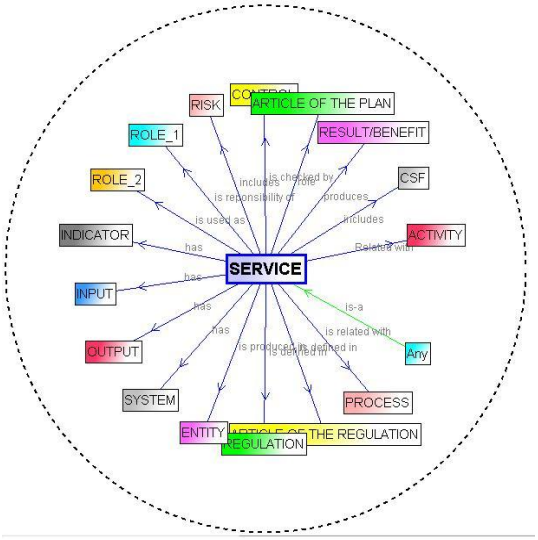

Figure 8. Service Class and Its Relations

A further study on the Service class reveals the type of relations with other classes, dimensions and cardinality, as given in Table 6.

Table 6**.** Tabular View of Service and its Relations

SERVICE	Type of Relation	Class	Relation
Service	is produced in	UNIT	M:N
	is defined in	REGULATION	M:N
	is defined in	ARTICLE OF PLAN	M:N
	Uses	SYSTEM	M:N
	produces	OUTPUT	1:M
	is for	USER	M:N
	is related with	PROCESS	M:N
	is responsibility of	ROLE_1	M:N
	includes	CSF	M:N
	includes	RISK	M:N
	is checked by	CONTROL	M:N
	Uses	RESOURCE	M:N
	Uses	INPUT	M:N
	produces	RESULT/BENEFIT	M:N
	is defined in	ARTICLE OF REGULATION	M:N
	Has	INDICATOR	M:N
	is used as	ROLE_2	

At this stage, the relation between the Service and the process is of M:N type, however, as further refinement occurs, another entity, called Business Process is defined to change the relation to 1:M type. This is in line with the condition that, one or more processes might be required to complete a Service. A Business Process in itself is meant to deliver value to the user, and this is why it will have to be treated as another Service, hence the Service has a cyclic relation with itself; one Service may be a combination of other Services.

One of the important outputs of the EPP Project is the ontology model of the public services inventory. This inventory might provide answers to some fundamental questions for public services in Turkey. Some answers that the inventory provided are:

1. Service to process relation (which processes are required to deliver a particular public service),
2. Information about regulation of any kind (Law, Cabinet decision, etc.)
3. System environment of public services, computerized tasks in the process,
4. Number of inputs and their types, which can also be used in calculating the bureaucracy level indicator,
5. Generated outputs and their types,
6. Total number of services used by citizens, public agencies, businesses and NGO's (non-governmental organizations)
7. The mean time of completion of each service and its activities, cross-linked to the process activities,
8. The role of the applicants,
9. The number of activities in servicing and responsible authorities of these activities,
10. The complexity of business of each service (bureaucracy level indicator) which is scored using number of documents, number of activities and the number of services given per year,
11. The number of usage of any specific type of input for all government services (the frequency of usage of any document and for the high frequency inputs a shared web service would be a fast solution to decrease bureaucracy and duplication),

12. Problems (bottlenecks, redundant activities, organizational issues, and legislative concerns) and solutions / improvements of service delivery, via performing simulations on the process models,
13. Problems and solutions / improvements of service delivery, via online measurement of processes utilizing Business Activity Monitoring,
14. Commitment to delivery (service level agreements) through measuring process performance metrics,
15. Identification of manual vs. computerized operations, and
16. Impact analysis (effect of one perspective on the others). This is basically finding answers to HOW questions, such as How to improve services through process management?; How does technology affect process performance?; How to compare different geographical and cultural approaches on the execution of service delivery processes?; How does a change in a legislation affect service delivery?; How to identify which legislative/regulative changes are required if processes are redesigned?; etc.

Questionnaires have been prepared regarding the generic ontological model, and are composed of five sections:

1. First part includes 8 questions about service to define the fundamental attributes of service, in terms of application and the results of it.
2. The second part is about the legislation framework of service regarding the taxonomic structure.
3. The third part is about inputs (documents in either hard or softcopy) required for application.
4. The fourth part is about business flow of service, after application.
5. The last part includes outputs of the service and their target users; namely the citizens, businesses, or other public agencies.

4.5. Object Model

The main classes/entities in SMM have already been discussed in *Section 4.4. Ontology*. In addition to the GFS classes, namely the Budget and Accounting related dimensions of Organizational, Functional, Economic, Financing, Geographic, Program, Revenue, and Accounting classifications; SMM Ontology model also includes classes such as Result/ Benefit, Plan, Goal, Service, Indicator, Process, Activity, Control, Input, Output, Policy / Regulation, Risk, User, Unit, Role, System, Source and Critical Success Factor, which can be represented, using UML notation as already presented in Figure 7.

Based on this Ontology, the SMM can then be translated into an entity model, with the following entities as shown in Figure 9, where "⊃" represents a "subset/collection/consists of" relationship:

1. vision ⊃ goal ⊃ objective ⊃ strategy, which can be read as "vision identifies goals", "goal identifies objectives", and "objective requires strategies";
2. portfolio ⊃ program ⊃ project ⊃ activity ⊃ task, "portfolio consists of programs", "program is a collection of projects", "project identifies activities", and "activity is completed by tasks";
3. process ⊃ function ⊃ activity ⊃ task, which can be read as "process is composed of functions", "function is composed of activities", and "activity is completed by tasks";
4. KGI ⊃ KPI ⊃ metric, which can be read as "KGI is further divided into KPIs", and "KPIs can be calculated using metrics";
5. resource ⊃ tangible asset ⊃ moveable asset ⊃ ICT, which can be read as "resource includes tangible assets", "tangible asset includes moveable assets", and "moveable asset includes ICT assets";

PFMVS object model establishes the necessary link between strategic planning, process management, and program execution enabling cascading down to the task level, and allows for strategic goal oriented program management. It is presented here to show the general structure of the classes in the ontology and a colour

scheme is adopted to group the related subclasses in one dimension. These colour groups can be further elaborated as follows:

- **RED: Policies** (Policies are the planned form of doing business guiding high level management and organizational decision making processes, whereas Regulations are the reflection of Policies on implementation level.)
    - Policy develops Regulations
    - Policy influences Objectives
    - Policy guides Processes
    - Policies guide Vision
    - Regulations enforce Strategy
    - Regulation enforces Tasks
- **BLUE: Strategy**
    - Vision defines Goals
    - Vision is guided by Policies
    - Vision creates / empowers Processes
    - Strategy is enforced by Regulations
    - Strategies enable Objectives
    - Strategy is implemented via / defines / controls Activities
    - Goal is comprised of Objectives
    - Goals are defined by Vision
    - Goal has Key Goal Indicators
    - Objective is realized through / require Strategies
    - Objectives are influenced by Policy
    - Objective mandates / directs Activities
    - Objectives constitute Goal

GREEN: Process

- Process is composed of Functions
- Process has Results
- Process has Outputs
- Process has Key Performance Indicators
- Processes are guided by Policy
- Processes are created / empowered by Vision
- Functions constitute Process
- Function is composed of Activities
- Control is a specific Function
- Function consumes Assets
- Function is supported by Programs
- Activities constitute Function
- Activity is completed by Tasks
- Activities are performed within Project
- Activities realize Strategy
- Activities are mandated by Objective

- **YELLOW: Performance**
  - Key Goal Indicators are associated with Goal
  - Key Goal Indicator is broken down into Key Performance Indicators
  - Key performance Indicators constitute Key Goal Indicator
  - Key performance Indicators apply to Portfolio
  - Key performance Indicators apply to Program
  - Key performance Indicators apply to Project
  - Key performance Indicator is broken down into Metrics

- **GREY: Program**
    - Portfolio has Results
    - Portfolio has Outputs
    - Portfolio is composed of Programs
    - Portfolio has Key Performance Indicators
    - Programs constitute Portfolio
    - Program is composed of Projects
    - Program has Key Performance Indicators
    - Programs support Function
    - Programs consumes Assets
    - Projects constitute Program
    - Project consumes Assets
    - Project has Key Performance Indicators
    - Project is broken down into Activities
    - Project is completed via Tasks
- **ORANGE: Asset**
    - Assets are consumed by Function
    - Assets are consumed by Program
    - Assets are consumed by Project
    - Asset is broken down into Intangible and Tangible Assets
    - Intangible Asset is broken down into Knowledge and Skill
    - Tangible Asset is broken down into Budget, Moveables, Employee, Property

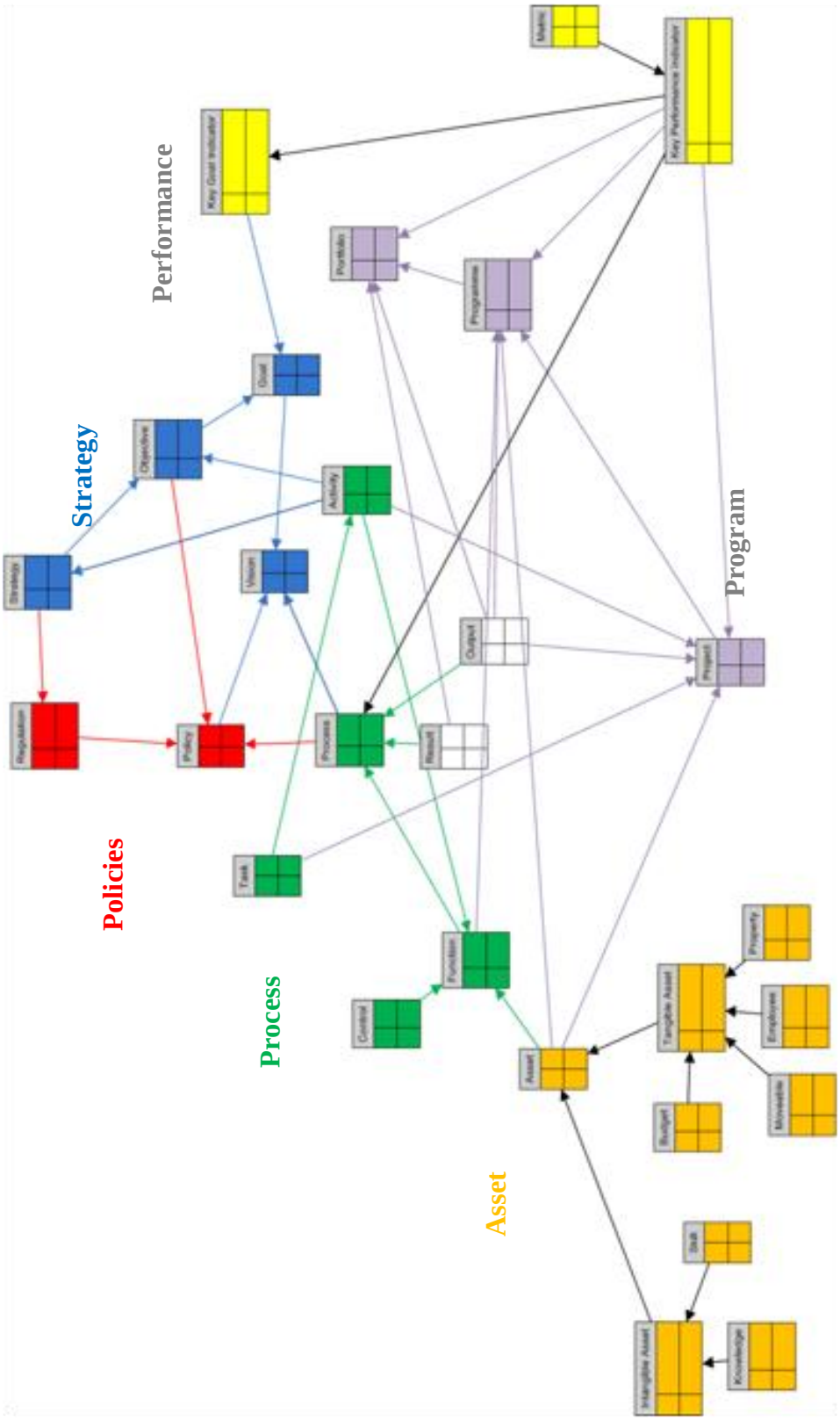

Figure 9. Public Financial Management Value

4.6. The Value Space and the Effectiveness Assessment

Linking the expenditure on ICT assets and strategic goals with the existing GFS framework allows for tracing the cost of the investment and current expenditure on each project and activity; and hence related process and service; through projecting the values and weighted calculation of the summation of the expenditure on the Strategic Goal axis. Finally each service delivery cycle, which is a process instance, can be costed and associated with achieving the cost of measurable objectives. This includes any expenditure, from staff payroll to ICT, from project specific investments (capital expenditure) to distributed fixed operational costs (current expenditure).

It has been shown that that the goal set {G1, ..., Gn} can be shown as an enumerated set in the Goal dimension in the PFMVS, constituting the SP, as given in Equation (12); with a set of outcomes (objectives). The effectiveness assessment is based on how close the agency are to the identified outcomes related with each Goal G_i.

It has also been shown that for each outcome, there exists a set of performance indicators, and for each Gi, a set of outcome indicators (KGIs), which is a weighted sum of KPIs; for each KPI, a set of metrics, calculated as the weighted sum of metrics. If KGI_{ij} is the j^{th} performance measure of the goal i, G_i, for each KGI, one can identify the realized (achieved $KGI_{ij}(r)$) values against the planned (expected $KGI_{ij}(p)$) value, the ratio of which determines how effective the agency is with respect to that particular goal.

If KPI_{ijk} is the KPI related to measure KGI_{ij} of G_i, and W_{ijk} is the weight of measure j related to goal i, each KGI_{ij} will be calculated as the weighted average of KPIs as given in Equation (13).

The weights of the measures can be calculated via either

1. (fuzzy) AHP techniques, or
2. the arithmetic distribution over the number of measures (100 / #KPIs), assuming they have equal importance.

The calculation of how much value is delivered in five categories, namely the Agency, User, Political, Strategic/Social, and Environmental values, for a particular Service, will be a weighted summation of achievement of KGIs related with that particular value category, is as follows:

AV = Agency Value = $V_a = \sum_i \sum_j W_{aij} \left(\frac{KGI_{aij}(r)}{|KGI_{aij}(p)|} \right)$ Equation (14)

UV = User Value = $V_u = \sum_i \sum_j W_{uij} \left(\frac{KGI_{uij}(r)}{|KGI_{uij}(p)|} \right)$ Equation (15)

PV = Political Value = $V_p = \sum_i \sum_j W_{pij} \left(\frac{KGI_{pij}(r)}{|KGI_{pij}(p)|} \right)$ Equation (16)

SV = Strategic/Social Value = $V_s = \sum_i \sum_j W_{sij} \left(\frac{KGI_{sij}(r)}{|KGI_{sij}(p)|} \right)$ Equation (17)

EV = Environmental Value = $V_e = \sum_i \sum_j W_{eij} \left(\frac{KGI_{eij}(r)}{|KGI_{eij}(p)|} \right)$ Equation (18)

The planned values for a KGI is taken as an absolute value, allowing the ratio to be negative. This is required, especially for cases where there is an anticipated negative impact in any one of these categories. The agency may decide to include both positive and negative values in the overall calculation, and offset negative impacts with the positive gains. Some typical examples of this situation will include the disposal of ICT, which has a negative impact on the environment; or implementing some projects despite their negative impact on the political gain (such as losing votes). Obviously, the agency would try to minimize the negative values.

The weights of the goals are calculated via either

1. (fuzzy) AHP techniques, or
2. the amount of budget reserved for the goals in the policy documents, and hence the SP, as $\frac{B_i}{B}$, where Bi is the budget allocated to achieve Gi and $B = \sum_i B_i$ is the total strategic budget of the agency.

Then, the PV of a Service can be calculated as the weighted sum of (Agency, User, Political, Strategic/Social, Environmental) value set.

V = Public Value for one Service Equation (19)

$= W_a V_a + W_u V_u + W_p V_p + W_s V_s + W_e V_e$

This calculation method also covers the PV delivery based on *(Organizational, Government, Community, Financial)* and *(User, Social, Government, Financial, Strategic)* benefits realization found in VMM (US), WiBe (German) and ICTBCG (Australian) models used for ex-ante evaluation of the programs for decision making. However, within the context of this research, only on a-posteriori benefits assessment will be focused on.

Similarly, if a program or ICT investment serves for more than one Service (S_i), the TPV is related with the sum of the values of individual goals, i.e. $\sum_i V_i$, hence TPV might be over 100%, which translates into preferences for synergy creation programs.

However, there are also cases where there is no direct benefit in one of the five value categories, resulting in zero value in that category, which in turn reduces the value perceived. A typical example is a defence project. The benefits are safety and security. In this case, PV might be lower in the weighted sum, however, if one value factor is above the threshold, the government may accept that the program have achieved the defined goals. The overall value calculation is defined as follows:

TPV = Total Public Value = max ($\sum_i V_i$, max(V_a, V_u, V_p, V_s, V_e)) Equation (20)

showing that the TPV is either the weighted summation of values in categories in Agency, User, Political, Strategic/Social and Environmental values, or the highest value earned through either one of these categories.

This calculation method also yields the Assessment Criterion,

(TPV > management_set_threshold) $\Rightarrow$ OK,

i.e. the effectiveness results of the IS are acceptable.

4.7. Extension of the Assessment – Linking with Expenditure

Economy, efficiency and effectiveness factors (3E rule of PFM) is needed to be linked as a performance assessment model. It is known that there is a certain budget

allocated to achieve each G_i. Let this amount be represented as B_i. The total strategic performance budget of the agency then becomes the summation of all goal achievement related budget items,

$B = \sum_i B_i$. Equation (21)

The model can be further extended to include budget execution ratio in the calculation. It is always desirable to achieve the same effectiveness level with less expenditure, hence the overall value can be multiplied by the ratio of expenditure (realized) to budget (planned). To link the effectiveness, efficiency and economy, the concept of Achieved Total Value can now be defined, which can be calculated as

$ATV = TPV / B$, Equation (22)

which represents the effectiveness factor related with each unit amount of money spent on achieving the TPV.

The agency performance will reported in the Annual Accountability Report and will be based on achievement of all goals, within the budget constraints. Similarly, another concept can be defined, the Achievement Cost as the amount spent to achieve one unit of value,

$AC = B / TPV$ Equation (23)

The realized budget is the cost, which is the summation of all budget line items represented classified under Expenditure taxonomy (the Economic dimension of the VS) as explained in *Section 4.2. Step-by-step Construction of the Value Space,* capturing all expenses related with personnel (01), goods & services (03, covers current expenditure for ICT assets), and allocated fixed costs for each agency goal generally based on the number of staff working towards achieving this particular goal.

For a-posterior (backward) traceability, this research proposes to use realized (achieved) values as explained in the formulas above, recalling that any expenditure item is represented allowing for comparisons amongst different agencies, functional codes, goals, etc. The agency can measure its objectives against published goals and performance indicators, and publish them to the public in year-end accountability

reports, which will be subject to the declarations by the Internal Control, Internal Audit, and finally External Audit. All data on the above VS can be directly collected from the operational IS.

4.8. Continuous Assessment Model

For a-posterior (backward) traceability, it is proposed to use realized (achieved) values as explained in the formulas above, and that all data should be directly collected from the operational SGB-Net IS. Continuous on-demand assessment model is depicted in Figure 10 below:

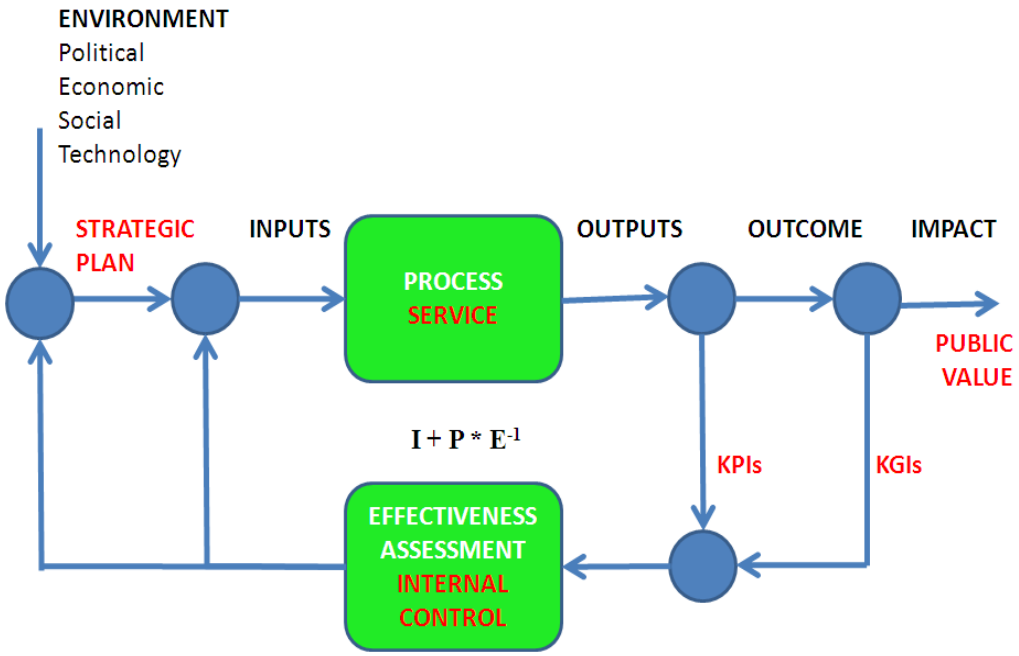

Figure 10. Using Effectiveness Assessment as a Feedback for Decision Making

SP is developed through an analysis covering political, economic, social, technological changes in the organizational environment; together with a feedback

provided through policy implementation (process) results assessed by the internal control mechanisms. Internal control deals not only with pre-financial and compliance controls but also with performance and effectiveness assessments, though not limited to IS initiatives, which should be reflected in regular monitoring and evaluation reports, and finally in the year-end accountability report.

SP, realizing itself in Goals and Objectives, constitutes the basis for Services and Processes. For a given set of defined Inputs, mainly the Budget in the public agencies, there is a set of measurable Outputs, yielding to Outcomes and Impact, hence Public Value as discussed in throughout this research. Outputs can be measured through KPIs, and PV through KGIs which are weighted combinations of KPIs. KGIs and KPIs provide feedback for the assessment and future improvements not only in realization of the initiatives but the SP itself.

Embedding our proposed assessment model in SGB-Net allows automated data collection and presentation in an interactive executive dashboard for managerial decisions which are then fed back into SGB-Net IS as a rule base for operations. The evaluation of ongoing performance is possible based on the collection of realization values for indicators and expenditure simultaneously on-demand through SGB-Net. There is a predetermined measurement period attribute defined for each indicator, ranging from daily to annual. At any time, all realization and cost values related with any service and organizational unit are collected for assessment, which are then used for regular control and revision of execution of initiatives, design of Performance Program (PP) for the following year, and the revision of SP for bi-annual periods.

The executive dashboard used for PFM decision making has also been implemented as part of the SGB-Net system, and is available for authorized users at yoneticiekrani.sgb.gov.tr. Sample screens, related with the assessment linking performance and budget, have been provided in *APPENDIX A. SGB-NET EXECUTIVE DASHBOARD SAMPLE SCREENS.*

Similarly, *APPENDIX B. IMPLEMENTATION NOTES AND SAMPLE SCREENS* presents the implementation level details and sample screens of SGB-Net, accessible at uygulama.sgb.gov.tr for authorized users. Finally, overview of the

STEPS methodology (Guclu, 2003-2006), which has been used as the baseline for the development cycle, which is also the basis for Process and Data Integration sections of the eGovernment Interoperability Framework of Turkey, and has become part of Regulation (Resmi Gazete, 2009) is presented in *APPENDIX C. OVERVIEW OF STEPS METHODOLOGY.*

CHAPTER V

THE CASE OF TURKEY

5.1. Legal and Institutional Framework

It is mandated by Turkish law that each government agency shall develop a five year SP, based on government level policy papers such as 5 year Development Plan, Medium Term Program, Medium Term Financial Plan and government priorities. The budget is developed accordingly, covering a three year period, only the first year being approved at the Parliament. The strategic part of the budget covers the initiatives, namely the programs and projects. This is called the PBB. At the end of the financial year, the agency then has to deliver the results achieved together with the budget spent to achieve the objectives set in the SP. This structure is depicted in Figure 11.

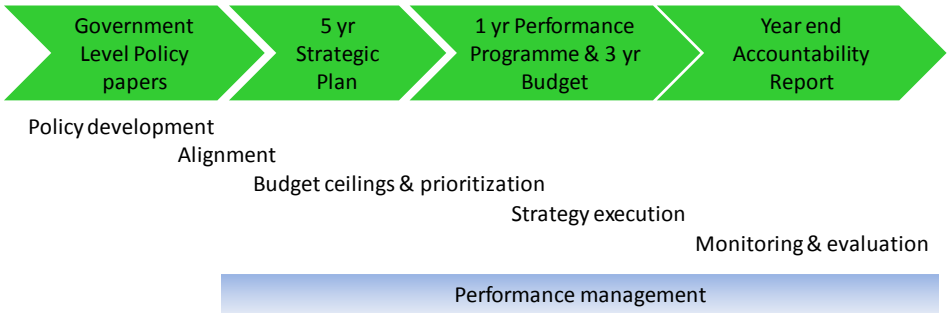

Figure 11.Requirements of Law no. 5018 in Turkey

It is rather easy to identify the benefits related with the citizen centric services, G2C. The first example will be for G2G (MoF), namely the Public Accounting, a service provided by the MoF to other public agencies. The G2G case is more intricate in identifying benefits to the public at large. Inputs are the resources consumed at the accounting offices country-wide, legislation, software used, etc.

Outputs are the number of offices/agencies served, the number of transactions per days, etc. Outcome is the proper bookkeeping for better financial management, compliant with international standards. The impact is fiscal discipline, accountability and transparency. MoF Turkey spends more than ten million dollars every year to maintain the Say2000i country-wide accounting IS, as license, hardware and consultancy payments, excluding the payment for salaries of approximately 100 staff dedicated to support the IS. Effectiveness is the difference between realized outcomes and the planned outcomes; i.e. a measure of the extent to which a project, program or policy achieves its objectives. Hence, effectiveness in example refers to the level of achieving better bookkeeping (which can be measured via the number of transactions corrected by the final account division retrospectively after the set-off period, and the completion date of central government's final account, etc.); level of compliance with the international (IPSAS) standards; and hence the level of increased transparency (which can be measured through the increased level of trust, decrease in the level of interest paid on public borrowings, etc.)

Law numbered 5018 regarding Public Financial Management and Control enforced all public institutions to adopt strategic and financial management approach and to develop SPs till 2009. The scope of the process is comprehensive and has several steps including PP, Accountability Report, PBB, Performance Evaluation, Performance IS and Internal Control.

- Public institutions prepare SPs – in compliance with development plans, programs, relevant body of the current law and their mission, vision and values in order to identify strategic objectives, measures and targets, to evaluate performance in line with predetermined indicators and to monitor and assess this process.

- Public institutions are obliged to base their budgets and resource appropriations on their SPs, annual objectives and targets and performance levels in order to deliver public service in the required level and quality.

Everything has to be aligned from the macro scale down to operational and budgeting levels.

Studies implemented should be linked with High Policy Papers / Economic Publications (IX. Development Plan, Medium Term Program, Medium Term Fiscal Plans, Emergency Action Plan, Annual Program and EU Pre-accession Economic Program)

SPO is the coordinator of strategic management issue in Turkey. In light of current guideline, there is a difference between application stated by law and SFO methodology through the preparation of SP. "Strategy Map", the basic starting point in SFO methodology is not covered in law. "Value created for stakeholders" should be the main focus in formulating the constituent perspective. Cascading of corporate SP to directorate basis is not emphasized in law.

MoF completed the first step in adopting new principles envisaged with Law 5018 and prepared its SP (2008-2012) one year earlier than stated by law since the Ministry wanted to be a pioneer and reference institution in the preparation of SP, providing a best practice for other institutions.

Methodology defined in Strategy Focused Organization (SFO) and the non-profit agencies, as proposed by Palladium (BIMSA & Palladium ES Group, 2007) can be evaluated as follows:

1. Translate strategy into operational terms

    - Create a strategy map and by locating perspectives / politics ensure strategic objectives are evenly distributed between perspectives (As the BSC approach does not directly fit into a policy making public organization, the MoF decided not to go ahead with SFO approach as presented)
    - Define a clear value proposition and define who are the internal and external stakeholders of MoF and ensure their requirements are covered in SP

(Services, goals with quality and quantity measures are defined in the revised SP and PBB; what needs to be done is to add the value chain concept, and the process definition of PV)

- Ensure linked cause and effect relationships between objectives (MoF did not develop a strategy map)
- SP is prepared with a bottom to top approach which creates a real challenge in defining targets and assigning ownership. Therefore, ensure these targets are set by upper level management and clear ownership, sponsorship is assigned
- Ensure objectives set are strategic rather being operational (revised as recommended)
- Ensure initiatives to reach targets are rationalized in the PP

2. Align the organization to the strategy
    - Ensure directorates' strategic objectives are aligned with MoF SP (a cascade model linking MoF goals to directorates, to departments and to individuals is developed)
    - Ensure directorates' PPs are prepared according to MoF SP
3. Motivate to make strategy everyone's job
    - Create a deep awareness throughout the organization regarding the need to shift to strategic management and importance of it, beyond the law
    - Improve and spread communication within the organization
    - Ensure everyone is feeling included in the plan
    - Link personal goals with MoF strategic objectives (Cascade model is developed and put into action in 2009 at the Strategy Development Unit (SDU, SGB in Turkish) as a pilot; Performance Budgeting Model is revised accordingly)
4. Govern to make strategy a continuous process

- Formulation of PP will be the real challenge for the MoF, ensure proper linkage between SP, PP and PBB (Projects and activities are already handled within the model; linking expenditure is within the scope of this thesis and the new model)
- Ensure correct initiatives are set to reach strategic objectives and budgeted accordingly
- Establish a formal review and monitoring process to govern the whole process (this will be handled through the Monitoring & Evaluation processes, in particular the Internal Control)

5. Mobilize change through executive leadership
    - Ensure participation and ownership of the upper management through the following steps ahead
    - SDU should keep the process continuous (Monitoring & Evaluation + Internal Control)

The lessons from the SFO and strategic management studies at the MoF, Turkey, can be summarized as follows:

- MoF decided that Balanced Scorecard and Strategy Focused Organization approach does not directly fit into a policy making public organization;
- Value proposition have been defined as services, goals with quality and quantity measures in the revised SP and PBB; with a further expansion possibility to link to the value chain and the process definitions;
- SP has been developed with a bottom to top approach which created a real challenge in defining targets and assigning ownership;
- In revising its SP, MoF reduced down the number of goals from 27 to 8, based on direct value to the beneficiaries, and used “employee satisfaction” as a strategy and hence as a measure rather than a goal;

- A cascade model linking MoF goals to directorates, to departments and to individuals has been developed and applied at the SDU as the pilot case; PBB Model is revised accordingly;
- A portal has been established disseminating project details.

The MoF has applied the above-mentioned implementation method in the revised SP, after failing to have an applicable one in the first round:

1. 17 services have been identified such as budget management, financial control, revenue policy development, accounting, national property management, and legal consultancy; with quality and performance measures.
2. STEPS methodology (Guclu, 2003-2006) has been partially applied
    a. to identify core business processes, management processes and support processes;
    b. Extended Event Driven Process Chains (Scheer, 2009) have been used to model expenditure processes;
    c. Visio stencil has been developed to model eEPCs; process chain diagrams have been linked to the process definition documents, service definition documents and relevant legislation;
    d. A 4-stage approach has been applied as problem definition in business terms, requirements definition, design description, and implementation;
    e. Models on expenditure process have been given to the software team for implementation; a 5 month process modelling period (35 person-months) resulted in a 2 month software development (10-person-months), proving a very cost effective and traceable means of implementation; and the rule of thumb: start with the business process model.
3. Dimensions and values used / can be used:
    a. Analytical Budget Classification (MOF, 2003), an extension of the GFS.

i. Organization (coding key: Minister > Undersecretariat > responsible management for policy implementation > first level of contact with the beneficiary benefiting from policy decisions, including support and logistics).

ii. Financing

iii. Functional (used as services)

b. Activity: No taxonomy has been developed. Will be included in the model in 2010 for tracking process costs.

c. Program, Project: Does not exist at the national level, implemented as pilot.

d. Income/expenditure (exists as two disjoint coding schemes under two other directorates, implemented in isolated ISs, data is exchanged through code transfer)

e. Geographic taxonomy: Does not exist, it is indirectly embedded in the organizational coding.

f. Accounting (exists as a disjoint coding scheme under a separate directorate, implemented in isolated IS, data is exchanged through code transfer)

Eventually, the PFMVS model has been implemented as part of the award winning software (1st prize, G2G applications, TUBISAD, 2007) for financial management of public institutions, developed by Stratek, called SGB-Net (Stratek, 2010) and in use at more than 100 public agencies as of June 2011, allowing for further consolidation of public expenditure information at a gross level for public financial decision making. Hence the resulting model implementation yields to a slightly different interpretation of Law 5018 of Figure 11, to enable continuous Monitoring and Evaluation process to be carried out in parallel with operations supporting the SP execution.

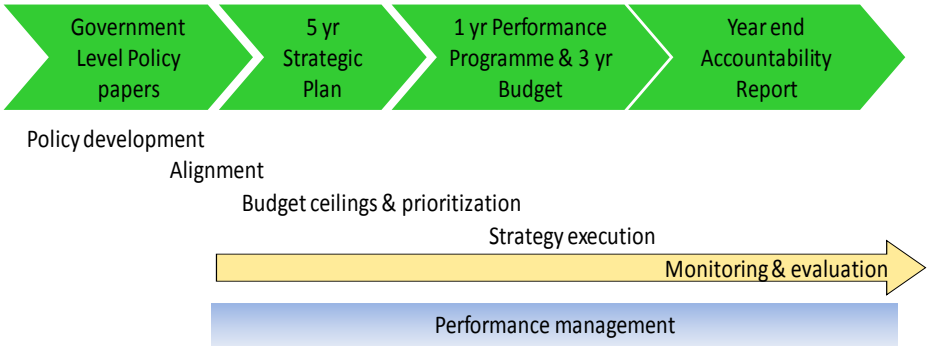

Figure 12.Requirements of Law no. 5018 in Turkey with continuous M&E

The proposed SMM and the assessment model will now be applied to two IS at the MoF, namely Say2000i used for government-wide accounting, and SGB-Net used for agency level resources management and accountability reporting, in line with strategic and operational plans of the agency.

5.2. Case Study: Say2000i, MOF

In the first example of MoF, namely the government-wide accounting IS, although there are 5 goals and 8 objectives, if G2 and O2.1 given in the SP is taken; "G2. To ensure effectiveness, economy, efficiency, accountability and transparency in the utilization of public resources" and "O2.1. To align financial management system with international standards".

Being mostly a policy making and controlling agency, MoF provides services, not directly to citizens, but to other government agencies. The MoF provides four primary services, namely Budget Management, Financial Management, Property Management and Legal Advice, delivering the following value categories:

1 Agency Value: level of increase in productivity, savings through technology, reduction of process costs (economic/fiscal effect), alignment with macro policies, staff satisfaction, better budget utilization;

2 User Value: fast and good-quality corporate services (faster service, reduced errors, reduced bureaucracy, availability and accessibility of government services, time savings, indirect monetary savings, in general – satisfaction of the other public agencies);

3 Political Value: effectiveness, economy, efficiency, accountability and transparency in the utilization of public resources; financial management system aligned with international standards, improved perception of government services, more added value for the Turkish economy;

4 Strategic/Social Value: robust and sustainable fiscal stance, fiscal discipline, rational allocation of public resources in line with public priorities and needs; increased protection of the rights of the state, reduced black economy, corruption and informal economy; reduced laundering proceeds of crime and financing terrorism; reduced informal economy; and

5 Environmental Value: none. As a matter of fact, at the time of writing, none of the agencies in Turkey formally see the environment as part of the value chain except for only a few institutions charged directly with environmental protection.

Within the scope of this research, Financial Management will be the main point of focus; comprising the subsidiary services for accounting, financial reporting, accountancy support, imposition, accrual and collection of taxes and other public revenues, auditing, financial management, internal control and internal audit support, preparation of budget implementation guidelines, inspection and audit, and European Union (EU) General Directorate (GD). If the Accounting Service is further zoomed into, the KGIs can be defined as:

1 The number of IPSAS standards adapted, (related with the political value)

2 The number of transactions on the central accounting IS Say2000i (related with the agency value), and

3 The number of spending units of the central government using Say2000i (related with the agency value).

These KGIs can be further broken down into KPIs as both quality and quantity indicators based on services delivered. There are 6 quality KPIs and 5 quantity KPIs defined, which are directly measurable through operational IS.

The Accounting Service can be further broken down into activities of accounting, auditing, legislations, transferring shares, adapting IPSAS, improving and maintaining the Say2000i system (comprising cash-based payment system project; ID management, ERP, performing the order of payment processes in spending units within the scope of Say2000i), and training and certification. Similarly, the Reporting Services can be measured through the 6 Quality and 4 Quantity KPIs. These KPIs can be further broken down into metrics related with the activities.

In the example given above, it is possible to trace the impact to the resources utilized, in monetary terms. This can be either at a generic level, or down to the project level. For example, in the MoF Accounting Services case, the overall cost of delivering services in 2009 is approximately 350 mio USD (230 mio USD for core processes, and 120 mio USD overhead), of which 26.5 mio USD is for the expenditure on goods and services. This approach allows for assessing the impact of the service delivery back to resource utilization, which will be covered later in *Section 4.6. The Value Space and the Effectiveness Assessment*.

It will now be shown how these five categories of values for the assessment of effectiveness can be collectively considered, through SMM.

5.2.1. Effectiveness Assessment for Say2000i

The weights at the MoF, Turkey, have been determined based on the budget allocations to achieve each goal. The budget line items have been allocated based on the Cost factors (C1 under Economic Classification in *Section 4.2. Step-by-step Construction of the Value Space*) as explained above.

The services as captured in the SP are first associated with a list of performance indicators. For each performance indicator, a percentage is determined by the combination of activities and decision of the management, for each service, which is then reflected to the budget. Hence a budget allocation to fulfil a performance indicator is a summation of a percentage of allocations for related activities. For

example, for the Accounting Service, the main performance indicator of strengthening the accounting system as per international standards can be achieved through Accounting, Reporting and Accounting Support activities. Immaturely, there is only one KGI, namely KGI5, for this service.

According to the 2009 Accountability Report of the MoF, the budget allocation is 95.01% for Accounting, 3.17% for Reporting, and 1.82% for Accounting Support, of the total 350 million USD, of which 34.28% is the overhead. This amount, excluding the overhead, related with the expansion and maintenance of Say2000i IS, is 40.43% of the overall budget allocated directly for the spending of MoF, and 93.73% of the budget allocated to achieve O2.1. Hence, the weight to be used for the effectiveness value, that is to achieve O2.1 of G2, is 0.9373.

KGI5 is a combination 9 KPIs, with the realization levels of 80%, 96.61%, 112.04%, 100%, 100%, 100%, 172.66%, 80% and 100%.

For the completeness of the picture, KGI4 also needs to be mentioned which is also related with the same objective O2.1. KGI4 comprises 4 KPIs, with the realization levels of 111.11%, 100%, 100% and 100%. The budget utilization is 2.54%, of the overall budget, and 6.27% of the budget allocated for O2.1.

KGI5 is under the responsibility of the GD of Accounting, whereas KGI4 is under the responsibility of GD of Budget and Fiscal Control. As the focus is on the Accounting Service, the associated values will be calculated related with KGI5.

As there is no specific weight assigned for any KPI, even distribution is assumed, and hence arithmetic mean, yielding to realization of 1.0458 for KGI5, 1.0278 for KGI4, and 1.0368 for O2.1, according to Equation (13).

In the SP, although wrongly, O2.1 is only associated with the Agency Value. Hence, for O2.1, and therefore Accounting Service, UV = 0, PV = 0, SV = 0, and EV = 0, as per Equations (14) – (18).

Consequently, application of Equation (19) yields

V = PV for Accounting Service = 1.0458 + 0 + 0 + 0 + 0 = 1.0458,

and Equation (20) yields

TPV = max (1.0458, max (1.0458, 0, 0, 0, 0) = 1.0458.

If the threshold set by the management is 0.80, then the TPV result is acceptable.

Experience shows that the effectiveness can be calculated even at the micro level of one initiative rather that at a more global service level. Please also note that, the impact of initiatives on the TPV cannot always be correctly identified if one focuses only on the budget for the determination of weights.

In this example of MoF, overall expenditure for O2.1 is 227.24, and hence, by Equation (22), ATV = 0.0000046, which means, MoF for this particular objective, has achieved 0.0000046 unit of performance for each dollar spent on the service. Similarly, by Equation (23), AC = 217,288, which means MoF had to spend more than 217 thousand USD to achieve 1 unit of performance for this particular service.

As MoF spent 95.21% of the planned budget (with 1.05 ratio), which yields a result in favour of the MoF, overall performance can be increased by 5%.

Please note that all data have been driven directly from the operational system SGB-Net and publicly available MoF documents.

5.3. Case Study: SGB-Net, MOF

The dimensions of the PFMVS, with relevancy to SGB-Net can be elaborated as:

i. Organizational: MoF.SGB.MIS_Department (12.01.00.23 for SGB), where SGB is the SDU, responsible from the coordination of the development of SP, development of budget, MIS, internal control, and year-end accountability reporting, within each public agency. The name SGB-Net refers to the network of SDUs in Turkey.

ii. Functional: L1.L2.L3.L4 representation for SGB is given as General_Public_Services.Financial_Services.Public_Financial_Management. Consultancy_and_Audit (01.3.2 representing the function of the SDUs).

iii. Economic: The “cost” items of IS investments and operational spending are given as

C1={01.1 Civil Servants, 01.2 Contracted Personnel, 03.1 Procurement of Goods & Services for Production, 03.4 Travel Expenses, 03.5 Service Procurement, 03.5.1 Consultancy, 03.5.2 Communication Expenses, 03.5.3 Transportation, 03.5.4 Regular Bills, 03.5.5 Rent, 03.7 Movables Maintenance and Service, 03.8 Property Maintenance and Service, 06.1 Goods, 06.1.2 Office Equipment, 06.1.2.01 Office Equipment, 06.1.2.02 Computer, 06.3.1 Software, 06.3.3 License, 06.6.6.09 Computer and Computer Systems Rental}.

iv. Financing: Such as from national budget (code 1), the World Bank, IMF, EU IPA, MATRA, TUBITAK R&D, or a combination of these especially in IPA projects.

v. Geographic: Existing 81 provinces of Turkey are implicitly represented within this classification of the Budget. We are considering using the SPO classification for "Priority Development Regions" for this dimension.

vi. Program: It has been introduced recently as part of PBB approach in Turkey. SGB involved projects are "Strategic Management System Project", "Strengthening the Public Financial Management and Control System in Turkey Twinning Project", "MoF SGB-net System Project", "Decision-Making and Performance Management in Public Finance (IPA Project)", and "Project for Strengthening Accountability within the Internal Control System (MATRA Project)". A Program/Project may serve for more than one objective. For example, SGB-Net serves G1, G2, and G5.

vii. Revenue: Not directly applicable in SGB-Net case.

viii. Accounting: The cost items of 03 Goods & Services of the Expenditure classification are given as

C2= {920.01.06.03.01 Software, 255.02 Office Equipment, 255.02.01 Computers and Servers, 255.02.02 Peripherals, 255.02.03 Photocopiers, 255.02.04 Communications Equipment, 255.02.05 Audio, Visual, Presentation, 258.90.06.03.03 Licenses, 280.03.05.05.10 Computer,

Computer Systems and Software Rental, 322.03.05.01.03 Computer Services Procurement}.

ix. Goals and objectives: As defined in the SP, the goals supported by SGB are "G1. To create a robust and rule-based financial structure", "G2. To ensure effectiveness, economy, efficiency, accountability and transparency in the utilization of public resources" and "G5. To ensure institutional perfection". Similarly, the objectives are "O1.1. To form spending policies which protect fiscal discipline and to allocate public resources in accordance with public priorities" and "O5.1. To provide fast and good quality service". Please note that, although SGB is also involved in coordination and internal control of the expenditure, it is not directly associated with G2 as its role is more of a consultancy and audit service.

x. Services: At the MoF, the set of services are categorized as primary and subsidiary. The MoF provides four primary services {Budget Management, Financial Management, Property Management, Legal Advice}. SGB provides subsidiary services for Budget Management, namely "General management and support services" and "Economic Sectoral Analysis services". SGB services, can be further broken down into "Strategy Development", "Budget Preparation", "Budget Execution", "Internal Control", "Accountability Reporting", "Operational Planning and Execution", "Monitoring and Evaluation", "SGB-Net Management", "Library Management", "Annual Economic Reporting", and "Sector Expenditure Review" activities. Based on the experiences from the previous years' implementations, the MoF decided to monitor less number of activities, hence SGB combined its list of activities under two main categories in in 2011 PP,

- General Management & Support Services / Strategy Development Service (SDS) (with a planned budget of 7,465,389 TL, of which 5,550,959 is to be funded from the MoF budget) with 3 KGIs, and
- Economic and Sectoral Analysis Service (ESAS) (with a planned budget of 1,857,853 TL) with 2 KGIs.

xi. Policies: MoF's starting point for the reforms is Public Financial Management and Control Law No 5018 (Resmi Gazete, 2003) which emphasizes government performance with regards to economic, efficient and effective utilization of public resources, and the Law No 5436 (Resmi Gazete, 2005) which sets out the responsibilities of SGB as strategic planning, budget management, monitoring and evaluation, financial and internal control, and accountability reporting directly to the undersecretary.

xii. Tangible Resources: In Turkey, the asset classification is developed as 5 sub-segments, and the complete set of moveable assets of government of Turkey can be found in (Prime Ministry, 2007) as part of legislation.

xiii. Intangible Resources: Not included in PFMVS at the MoF.

xiv. Risks: Not included in PFMVS at the MoF as the model is currently developed for ex-post assessment, will be extended in 2011 to cover ex-ante assessment as well as part of the Internal Control based on COSO (COSO, 2004).

5.3.1. Effectiveness Assessment for SGB-Net

Focusing on Financial Management function, the KGIs directly related with SGB have been defined in the SP as:

1 ESAS supporting O1.1 (O8)

1.2 Number of reports prepared on policy analysis capacity (indicating the number of sectors utilizing policy analysis capacity; revealing political value and strategic/social value), and

1.3 Number of reports issued within the scope of economic analysis (user value, political value, strategic/social value).

2 SDS supporting O5.1 (O8)

2.2 Entry rate of the Ministry expenditures to the expenditure management module (agency value),

2.3 Number of units that can prepare operational plans (agency value), and

2.4 Number of units that can monitor their performance objectives and indicators (agency value).

These KGIs can be further broken down into KPIs as both quality and quantity indicators based on services delivered. The SGB related quality and quantity KPIs, which are directly measurable through SGB-Net, are:

1 Number of sectors policy analysis capacity is applied,

2 Number of services assessed for performance,

3 Number of transactions on which pre-financial control (within the scope of internal control) / total number of transactions in identified risk areas,

4 Number of units capable of implementing PP and monitoring objective indicators,

5 Ratio of tasks completed by the due dates as set in the Internal Control Action Plan,

6 Customer satisfaction rate,

7 Staff satisfaction rate,

8 The ratio of total cost of internal support services to that of total service,

9 Work done/work to do, and

10 Estimated duration of work to do/duration of work done.

Using the SMM, it is possible to trace the impact to the resources utilized, in monetary terms. This can be either at a service, MoF, Budget Unit (such as SGB) level, or down to the project level such as SGB-Net.

As the 2010 Accountability Report has not been developed at the time of writing, we will take the year 2009 as the basis for assessment. 2009 budget of the Ministry is 52.5 billion TL. 976.4 million TL amounting to 1.9% of the total budget was allocated for the expenses of the Ministry. 885.4 million TL of the mentioned allocation was related with the PP. Total amount of the expenditures made within the scope of the PP was 921.2 million TL. For the whole of MoF, the 2009 calculations to be used for assessment, as per Equation (13), are as given in Table 7:

Table 7. Assessment Basis for Ministry of Finance Objectives

	Objective	Expenditure (million TL)	Appropriation (million TL)	Spent/ Planned (%)	KGIs (#)	Achievement (%)	Weight (%)
1	O1.1	6.63	8.16	81.25	4	100.00	0.72
2	O1.2	1.19	1.58	75.32	4	95.83	0.13
3	O2.1	340.86	357.98	95.22	19	97.71	37.00
4	O2.2	129.59	131.96	98.20	9 [4]	n/a	14.07
5	O3.1	142.20	71.33	199.36	6	100.00	15.44
6	O4.1	7.48	7.78	96.14	7	81.81	0.81
7	O4.2	31.51	31.04	101.51	15	92.00	3.42
8	O5.1	261.75	275.57	94.98	3	92.31	28.41

The same universal data set, depending on the viewpoint, which is determined by the subset of values in PFMVS, can be used to perform the assessment both at the macro level (TPV delivered by the agency with all expenditure), and micro level (effect of IT investment on the TPV delivered by the agency) with associated indicators. Hence, SMM also provides for the basis for performance audit of agencies with detailed comparison of services and organizational units through fixing relevant dimensions.

In 2009, the total appropriation for SGB was 5,635,000 TL, with total expenditure of 5,448,000 TL. Spent/Planned budget ratio is 96.68%; which is 2.02% of the total expenditure for the two objectives. For O1.1, SGB utilized 27.3% of the budget allocated for O1.1 and for O5.1, SGB utilized only 1.94% of the budget allocated for this objective.

Within 67 KGIS, SGB was responsible from 5, 2 of 4 for O1.1, and 3 for O5.1. Although SGB was responsible from all 3 indicators of O5.1, that was a coordination and monitoring role, and hence only a small fraction of the budget allocated for O5.1 was utilized by SGB.

[4] No performance indicator was monitored under the Strategic Objective 4 in 2009, which is "O2.2 *To increase value added to the Turkish economy by rational utilization of public immovables.*" Hence 9 performance indicators were not monitored in 2009.

The achievement by SGB is 100% for O1.1 and 92.31% for O5.1. The weights have been determined based on the budget allocations to achieve each goal, which are 0.1658 and 0.8342, respectively. The budget line items have been allocated based on the Cost factors explained previously.

For O1.1, and therefore SDS, applying Equations (14) - (18), AV=0, UV=0, PV=1.00, SV=1.00, and EV=0. Consequently, V=(PV for SDS)=1.00 as per Equation (19).

Similarly, for O5.1, and therefore ESAS, applying Equations (14) - (19), AV=0.9231, UV=0, PV=0, SV=0, and EV=0. Consequently, V= (PV for ESAS) = 0.9231.

By Equation (20), overall value derived from SGB-Net is the summation TPV=1.9231, as the same IS is supporting two Goals. If the threshold set by the management is 0.80, TPV value is well above this threshold, and hence is acceptable.

Similarly, overall SGB expenditure for O1.1 and O5.1 is 3.384 million USD, and hence ATV=0.57, which means, MoF for these particular objectives, has achieved 0.57 unit of performance for each thousand dollars spent on the services. The AC=1,759, which means MoF had to spend approximately 1,759 USD to achieve 1 unit of performance for these particular services, using Equations (22) and (23).

As SGB spent 96.68% of the planned budget (with 1.034 ratio), overall performance can be increased by 3.4%.

5.4. Comparison of Two Case Studies

Compared with the example of GD of Accounting within the same Ministry (*Section 5.2. Case Study: Say2000i, MOF*), although the effectiveness values in individual service components of SGB-Net are slightly smaller (1.00 and 0.9231 as opposed to 1.0458), the synergetic effect increases the TPV dramatically. Similarly, AC is 1,729 USD against the 217,288,200 USD to achieve one unit of performance. This readily shows that effectiveness is not related with economy and efficiency, and hence is not sufficient to assess the real value generated by and IS project.

The indirect contribution of SGB-Net to services not under the direct responsibility of SGB was not taken account in the calculations above.

MoF has developed a unique technology sharing approach in Turkey and has provided SGB-Net to 100+ agencies (at the time of writing) free of charge, through protocols, ensuring not only further economy but also standardization. Although the impact of SGB-Net has not been calculated at each one of these agencies, we can postulate that a side benefit of SGB-Net is increased economy and effectiveness due to technology sharing.

From the example applications in Turkey, it is concluded that:

1 Agencies lack the capability of developing full set of cross-checking indicators for assessment of effectiveness on five even the first four categories;

2 There is no fixed list of indicators for assessment, and the list depends on the domain;

3 The indicators can be broken down as KGIs (related with the achievement of the goals, hence related with the effectiveness), KPIs (as the breakdown of KGIs), and lower level Metrics.

The assessment model with SMM, also allows for measurement of both organizational and service delivery (process) performance and effectiveness based on the given SP. If Table 7 is expanded with all Objectives in the first column, the same data set within PFMVS provides for the assessment of TPV delivered by the agency, as the Goals & Objectives classification of the VS also covers initiatives not related with IS investments, and they should be specified in the PP of the agency. SMM Internal Control approach, as presented in Figure 10, provides for the basis for effectiveness assessment of services, and hence performance audit of agencies, using the calculation method described in *Section 4.6. The Value Space and the Effectiveness Assessment* and *Section 4.7. Extension of the Assessment – Linking with Expenditure*, associated with Budget dimensions detailing the cost of delivering the envisaged services with planned performance indicators within the SP. If the dimension associated with the organizational structure (Organizational classification) is fixed, it is possible to compare performances of the spending units,

if the dimension associated with services (Services classification) is fixed, it is possible to compare performances of services delivered by the agency, and so on. This will even allow for cross-agency comparisons, if the PFMVS covers agencies at the Organizations classification level, which is the case for government-wide budgeting. SMM can be used to measure the government-wide effectiveness assessment.

5.5. Validity and Generalizability of MoF Case Studies

Being an empirical method, the case study method has been prone to concerns regarding methodological rigor in terms of validity and reliability (Gibbert et.al, 2008). The validity of the study has to be emphasized for the trustworthiness of the results, to what extent the results are true and not biased by the researchers' subjective point of view (Runeson & Höst, 2009), in case study approach.

In the positivist tradition, four criteria are commonly used to assess the rigor of field research: (i) construct validity, (ii) internal validity, (iii) external validity, and (iv) reliability (Gibbert et.al, 2008) (Runeson & Höst, 2009). Gibbert, Ruigrok & Wicki (Gibbert et.al, 2008) emphasize that "the three validity types are not independent of each other. Without a clear theoretical and causal logic (internal validity), and without a careful link between the theoretical conjecture and the empirical observations (construct validity), there can be no external validity in the first place. Thus, there is a hierarchical relationship of validity types," with construct and internal validity acting as an indispensible condition for external validity. This logical prerequisite for external validity is a case study's internal and construct validity can be represented as:

Internal validity → Construct validity → External validity → Reliability

Runeson & Höst (Runeson & Höst, 2009) emphasize that case study is an iterative approach where data collection and analysis is conducted in parallel, and triangulation is important to increase the precision of empirical research. Triangulation refers to applying different points of view towards the studied object, collecting data from multiple sources in a planned and consistent manner (data source triangulation), using more than one observer in the study (observer

triangulation), combining qualitative and quantitative data collection methods (methodological triangulation), and using alternative theories or viewpoints (theory triangulation), thus providing a broader picture. It is important to establish a clear chain of evidence from initial research questions to the final conclusions.

Lethbridge, Sim & Singer (Lethbridge et.al., 2005) define three degrees of researcher involvement in data collection. Although their approach is specific for software engineering, it can be used for any case study research.

1. First degree (direct involvement of the researcher),
2. Second degree (researcher directly collecting raw data without actually interacting with the subjects during the data collection), and
3. Third degree (independent analysis of archival and complied data).

Runeson & Höst (Runeson & Höst, 2009) also propose that if the context is considered being the specific company or application domain, they have to be seen as two separate holistic cases.

Two case studies have been used to validate the results of the present research. Quantitative data have been gathered through publicly available MoF documents, mainly the SP, PP and accountability reports; and the SGB-Net system. An envisaged deficiency related with the tendency of polishing data and results in publicly available documents have been circumvented to an extent through direct data capture from the operational software. Formal qualitative analysis techniques have been applied in the form of COBIT and SFO assessments. Observations have been documented based on daily interaction with managers and users at the MoF. Mostly the second and the third degree data collection techniques have been utilized for the MoF case studies. Both of the case studies have been conducted within the same organization, in conformance with the nested approach (Gibbert et.al, 2008). Data source triangulation and methodological triangulation have been applied, with informal observer and theory triangulation, based on experience and many years of field study.

Limitations of this research are discussed below in *Section 6.2 Limitations and Further Research*. Although triangulation and nested approach have increased the

generalizability of the findings, having carried out only two case studies and the lack of perspectives in triangulation have limited the general validity of the conclusions, and further results will be studied after at least one year of implementation at other agencies using SGB-Net. Additionally, the MoF of Republic of Tajikistan will commence using SGB-Net in June 2011, which will allow for comparison of results in different economic and cultural settings. Methodologists differentiate between statistical generalization and analytical generalization (Gibbert et.al, 2008). Analytical generalization is different from statistical generalization in that it refers to the generalization from empirical observations to theory, rather than a population of case studies that can be a starting point for theory development. Gibbert et al. suggest that a cross-case analysis involving four to ten case studies may provide a good basis for analytical generalization. Such an exercise has been considered to be beyond the scope of the present study. As such, the generalizability of the findings of this research are summarized in the following table:

Table 8. Methodological Rigor and Generalizability of Findings

Methodological Rigor	**Comments on two MoF Case Studies**
Internal validity	Research framework is clearly formulated with causal relationships between variables and outcomes, enabling repeatability Empirically observed patterns have been developed and compared with the predicted ones Theory triangulation needs to be formally introduced, although the assessment model takes into account extensive literature survey
Construct validity	Chain of evidence has been established Data source triangulation has been applied, archival data have been used, limited interview data exists in archival reports, both participatory and direct observation has been utilized
External validity	Analytical generalization has been applied, with limited number of case studies, namely 2 in a nested approach, which need to be increased to 10, including 3 other country settings Both of the case studies have been selected from the MoF setting the standard for country-wide application
Reliability	Transparency has been addressed through documentation within the MoF portal, and replication is handled through existing SGB-Net database

CHAPTER VI

CONCLUSIONS

6.1 Summary of Work Done

The main novelties within this research can be summarized as the development of an extensible model to continuously assess the effectiveness of public IT investments; and the related basis for implementing the IS to realize the model.

This research details a unified and extendable model for assessment of the effectiveness of the government IS, with two case studies. The concepts of economy have been merged with the concepts of IS, business and technology, making assessment of strategy-business-IT alignment easier in the SMM. This SMM is partially implemented as SGB-Net IS and applied to the examples of the MoF (one of the 100+ agencies using SGB-Net at the time of writing) in Turkey.

6.1.1. Research Contributions

Within the scope of this research, a unified model called SMM has been developed over PFMVS.

6.1.1.1. Value Space Approach to Assessment

GFS model has been extensively extended with Strategic and Performance Management concepts, resulting in development of PFMVS based on the PV concept. The rules of the PFMVS have been defined; and consequently mapped to PFM Ontology Model. PFM Ontology is then mapped to PFM Object Model for implementation.

6.1.1.2. Individual and Aggregate Assessment Indices

PV components have been defined within the developed PFMVS in five main categories, namely Agency, User, Political, Strategic/Social, and Environmental values. Assessment Model has been developed using these value categories and calculation method for both individual and aggregate PV components have been developed.

PV has been defined to be calculated as a weighted summation of the five Value categories, yielding to the Assessment Criterion of TPV being above a government/agency set threshold. Calculation method, resulting in a single value, allows for cross-comparison of programs, agencies, functions, etc. by fixing the values on the dimensions under analysis; ensuring standardization, consolidation and comparability across agencies.

6.1.1.3. Linking Economy, Efficiency and Effectiveness

Assessment model has been extended, by linking the economy, efficiency and effectiveness factors. This link allows for performance assessment, associating the effectiveness with the budget, through Achieved Value and the Achievement Cost.

6.1.1.4. Continuous Monitoring and Execution for Decision Making

SMM has been extended with continuous M&E approach rather than a year-end assessment, hence it can be used as a decision support tool of effectiveness of not only IS but also services provided by government agencies in general.

6.1.2. Practical Contributions

Main practical contribution of this study can be summarized as directly linking the budget planning and execution to the goals identified in the SP based on the PFMVS dimensions, allowing for forward traceability for budget planning and appropriation and on-demand backward traceability for expenditure. These can be further grouped under the Beneficiary and Technical categories.

6.1.2.1. Beneficiary Side Contributions

The contributions of the model on the Beneficiary side can be group under three categories, Justification, Implementation, and Case Study, a proven implementation at more than 100 public agencies, still to be expanded until the end of 2011.

6.1.2.1.1. Justification for IS Investments

There is yet no unified framework for assessing the effectiveness of Government IS. Although different countries have developed and are still developing various methods for assessment of investment programs before the program and related projects commence, Turkey is lagging far behind in adapting any one of these approaches, not even at the stage of discussing the Enterprise Architecture.

An easy to use model is needed which takes into account the SP driven initiatives which are mainly based on social and political factors in policy making institutions such as the MoF. The PFMVS model provides means of Business – IT alignment.

This model is applied by e-Bütçe which is the Budget Management for all public institutions in Turkey, and *SGB-net* which is the operational level management software installed at more the a quarter of overall Turkish public agency portfolio; and has been in operation long enough (10 years at the Budget Office and 3 years at agency level) to prove its value.

6.1.2.1.2. Easy Implementation

The model allows even the top level management perform the assessment without too much in-depth knowledge of economic modelling techniques.

On the PFMVS, any goal and objective is traceable down to the single expenditure by just placing an expenditure object in the PFMVS and taking the related projection on the SP axis and the ICT asset axis.

Selecting and fixing the objective, one can draw a planar cross-section, providing the expenditure for all ICT assets and related human assets. The summation of these expenditure items provides the cost of achieving the selected objective. Similarly selecting and fixing any expenditure item, objectives served by investing in the selected ICT assets can easily be determined.

The PFMVS structure, when used as a standard throughout the public agencies, allows for consolidation of all ICT expenditures associated with agency goals and objectives. This facilitates the MoF consolidate and analyse the overall public ICT expenditure.

6.1.2.1.3. Proven Case Studies

The MoF management can develop comprehensive what-if type scenarios for policy making, at sectoral level, such as education, health and agriculture. The management can assess expenditure against objectives on demand, and then can assign rules on expenditure limits even during the budget execution phase.

Selecting and fixing one dimension, various comparisons can be performed on the PFMVS; regarding the backward traceability, ICT expenditures of various agencies can be compared, ICT expenditures related to different functions can be compared, ICT expenditures related to agency performance indicators can be compared; and hence analysed. Overall public performance scorecard can be derived via the PFMVS model.

An early warning system can be built on the PFMVS comparative analysis model. PFMVS structure lends itself very well for OLAP type applications. Any user, based on his/her role, can look at the cube from a different dimension; organizational, functional, economic, and performance.

6.1.2.1.4. Cost Savings in Implementation

A comprehensive Enterprise Resource Planning package SAP could have been used for the country and agency wide management. SAP requires approximately 60,000

parameters to be configured based on the process flows and the needs of the agency. Configuration requires SAP expertise and generally takes 4-12 months to implement, whereas with the approach in this research, the implementation period is about 5 days including the configuration and training, which is carried out directly by public employees, the staff of the MoF.

SAP costs about 250,000 USD + (more than a million USD for mid to big size agencies) depending on the size of the agency, and the most expensive component in the implementation is the cost of the qualified SAP experts. The cost of PFMVS implementation *SGB-net* to the public agencies is nil as the copyright is now owned by the Turkish government. One domain expert and one technical expert will be sufficient for the implementation.

This applies to the total cost of ownership as maintenance costs are incomparable as well, about %15 of the acquisition cost vs. nil. *SGB-net* is distributed through a central site allowing for automatic updating.

As *SGB-net* is a government distributed package, certain standards are enforced and automatically implemented with a new release of the software depending on the ever-changing rules and regulations, allowing for better consolidation of agency data at the MoF through web services.

6.1.2.2. Technical Contributions

6.1.2.2.1. Increased Software Quality (as per ISO 9126-1)

- Usability. When user-defined short cut quick codes are used for the representation of the expenditure item type in the PFMVS, the user is isolated from the long list of hierarchical codes, allowing easy learning and operations.
- Efficiency and Maintainability. The PFMVS model allows for generic implementation of PFMVS (implemented as VS in SGB-net), making easy, quick and consistent extension of dimensions as they are orthogonal, consuming less development resources.

- Stability, Changeability and Testability. A change in one dimension does not affect the other dimensions, and hence can be implemented and test quicker.
- Portability. A Data Abstraction layer and ValueSpace access library makes the software independent from underlying system software.
- Adaptability. Should a need arises on either expanding the taxonomy defined within each dimension, or add a new dimension to the system, the PFMVS structure allows for flexible implementation, as demonstrated by the application of *SGB-net* to more than 100 different institutions.

6.1.2.2.2. Advantages for the Development Team

As modular object oriented approach has been taken, the software allows for easy and quick expansion. Any change in the model can be easily and quickly reflected to software for modification and dissemination

Development approach and already developed class library for VS management allow for fast learning curve for especially new developers.

6.2 Limitations and Further Research

The deficiencies and future extensions can be stated as follows:

1. **SP is assumed to exist and hence not validated.**

   The model assumes that a SP has already been developed and hence the objectives/goals, based on higher level policy papers, are identified together with KGIs and KPIs. The model does not provide facilities to prioritize any one of these values and/or the goals associated with them. Hence, the model assumes that the goals associated with all of these values, including the political value, have already been identified, prioritized, accepted by the agency management and are in line with higher level government objectives.

   The model does not calculate the PV if the outcomes are not defined prior to the assessment, hence if the environmental impact is neglected in the plan, no value will be calculated in this version of the model.

This research does not attempt to validate the SP itself, nor does it attempt to provide a model to be used for the selection, funding and setting budget ceilings of initiatives (programs, projects) proposed for.

2. **Risk has to be included in the model.**

   Currently the model does not include a unified approach for associating risk directly in the formulation, which needs to be carefully considered, although there is a provision for it.

   It is planned to complement the continuous monitoring and evaluation with COBIT and COSO plug-ins.

3. **Weights management has to be more formalized.**

   A formative method for weights management has not been defined yet, currently only budget load and AHP are considered. This also depends on the maturity level of the agencies. There is a plan to use Data Envelopment Analysis (DEA).

4. **Assessing Environmental Value.**

   Although the model includes Environmental Value, it is not handled within the scope of this research, and it is assumed that this value only appears if specific objectives and initiatives are defined in the SP.

   The model does not assess impact, but effectiveness. Although not specified in the SP, the values might be in conflict, an initiative yielding to a maximum value in one category may yield to a negative impact value on another category. Political, User and Environmental Values will often appear to be in conflict. This approach will eventually tell us how much damage can be tolerated in one value (such as environment) while other values might have positive indicators (such as building a dam for energy and job creation). An extension should be considered to include the values associated with unspecified value categories (in the SP) such as the environment. The conflicting values are included in the overall calculation through negative indices of the value categories.

5. **Further expansion of the model.**

- New value categories may be added; specifically, Strategic and Social Value may be separated.
- The model does not support Maturity Based Assessment, which was taken into account in PB-ISAM (Özkan, 2006), although missing in coverage for multidisciplinary approaches, formal link between expenditure and goals, PV concept based on external value delivery; which can be a complement to the model.
- The model can be extended by Policy and Impact Analysis models, together with econometric formulations, including time-series analysis to see the past / present / future trends.
- The model can be extended with ideas from Method Engineering.
- A spidergram representation with each dimension corresponding to a Value category, can be adopted once further results are obtained from the other agencies, to comparatively analyse the TPV generated by these agencies, resulting in a global public sector / government scorecard.

6.3 Overall Evaluation: Standardization and Simplification for PFM

The model introduces simplification over complex and chaotic PFM environment, as by zooming in, one can focus on any set of dimensions, the same set of values can be interpreted with multiple perspectives such as organizational, functional, and performance. The model allows for continuous monitoring and evaluation of the programs underway for internal control purposes of the agency and for external audit, rather than providing a one-time assessment. The same model can be used not only for IS effectiveness, but also for assessing the effectiveness of any well-defined program or project. Calculation method allows for a-posteriori benefits assessment as opposed to other international models used exclusively for ex-ante evaluation of the programs for decision making. The model can be used as a tool for impact analysis of the policy decisions. Finally, mapping the VS to ontology

and then to object model, allows for flexible classification structure, and hence flexible system implementation.

The author expects, and indeed has observed, that the ability to continually track effectiveness during as well as after program execution is definitely appreciated by public management in different realms of activity, not only confined to information systems.

Implementation of the proposed approach and method more extensively in different settings will naturally uncover new deficiencies and needs, to be addressed by future researchers in the area.

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APPENDIX A.

SGB-NET EXECUTIVE DASHBOARD SAMPLE SCREENS

Sample SGB-Net executive dashboard screens at the MoF, Turkey, allowing for continuous assessment are provided in Figure 13, Figure 14, and Figure 15. These dashboard components link assessment with performance and budget.

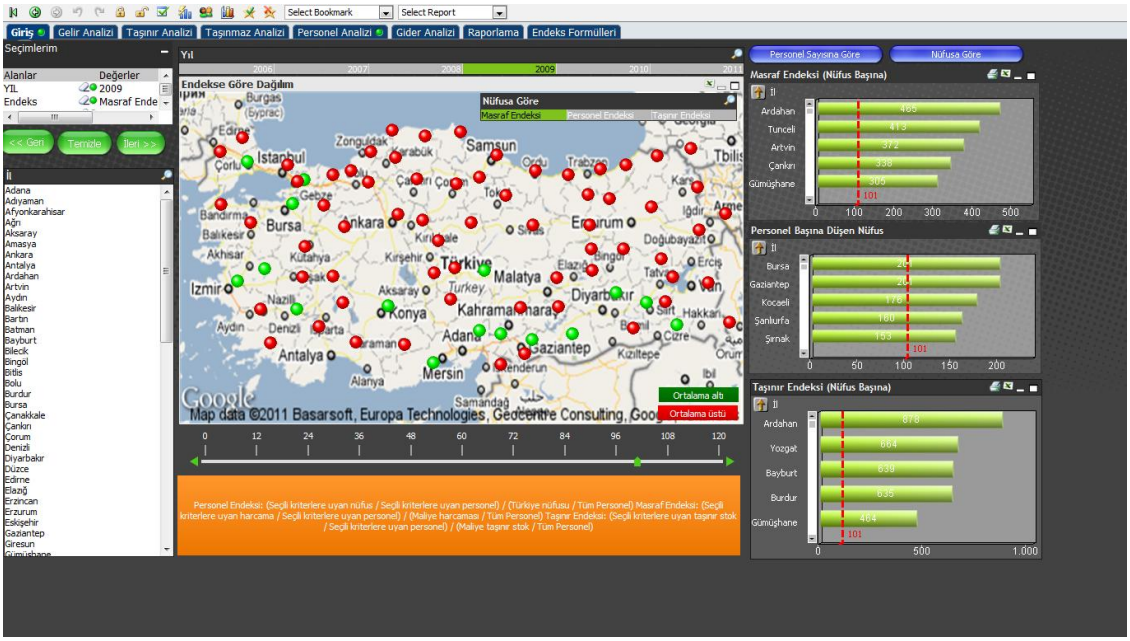

Figure 13. SGB-Net Dashboard: Overall View of Spending Units

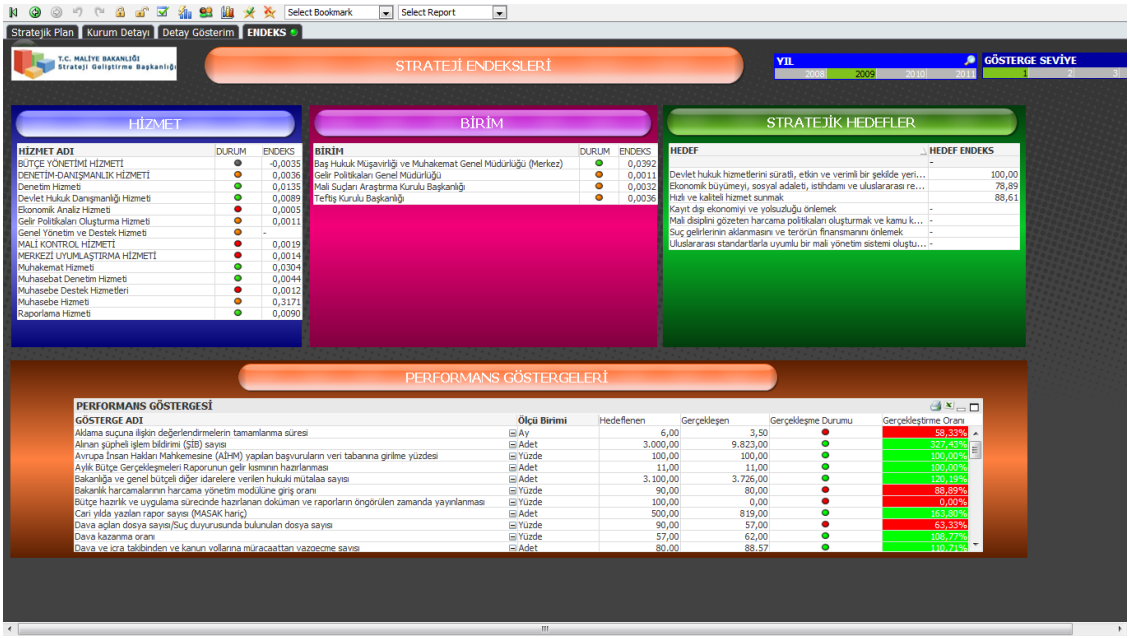

Figure 14. SGB-Net Executive Dashboard: PIs for 2009

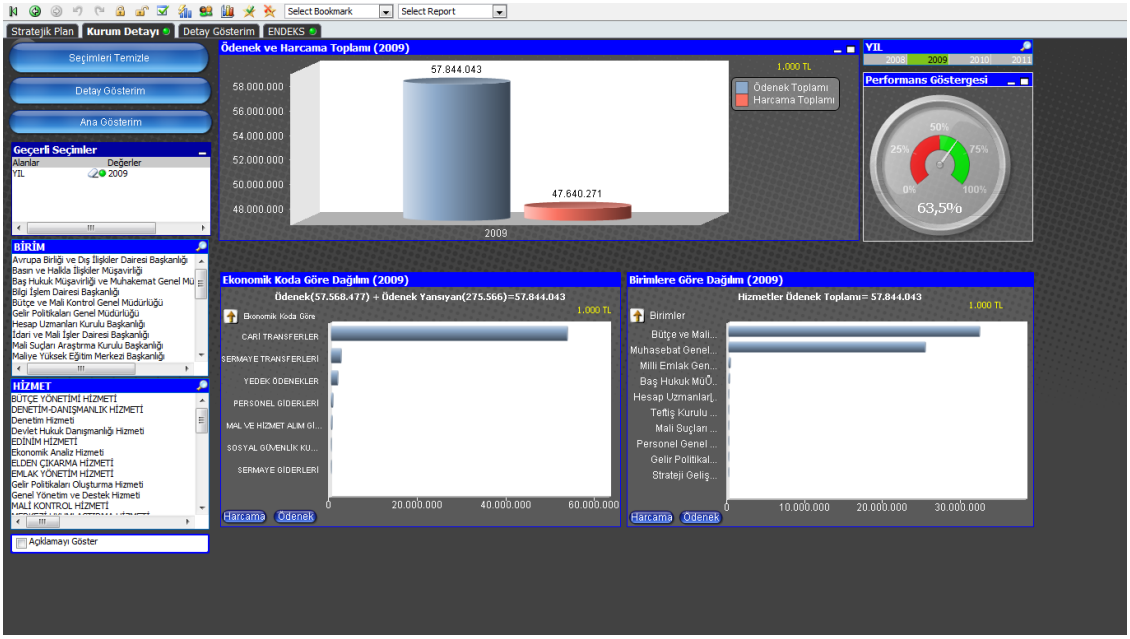

Figure 15. SGB-Net Executive Dashboard: Performance and Expenditure

APPENDIX B.

IMPLEMENTATION NOTES AND SAMPLE SCREENS

Although the implementation of SGB-Net is not within the scope of this research, it is mentioned here for the completeness of the SMM, as applied at the public agencies. The SMM, in line with the general object model, has been implemented as SGB-Net. SGB-Net utilizes the following VS and PBB classes presented in Figure 16 and Figure 17. Similarly, sample screens have been provided in Figure 18, Figure 19, Figure 20, and Figure 21, showing the related SP of the MoF. The application is accessible by authenticated and authorized users at uygulama.sgb.gov.tr.

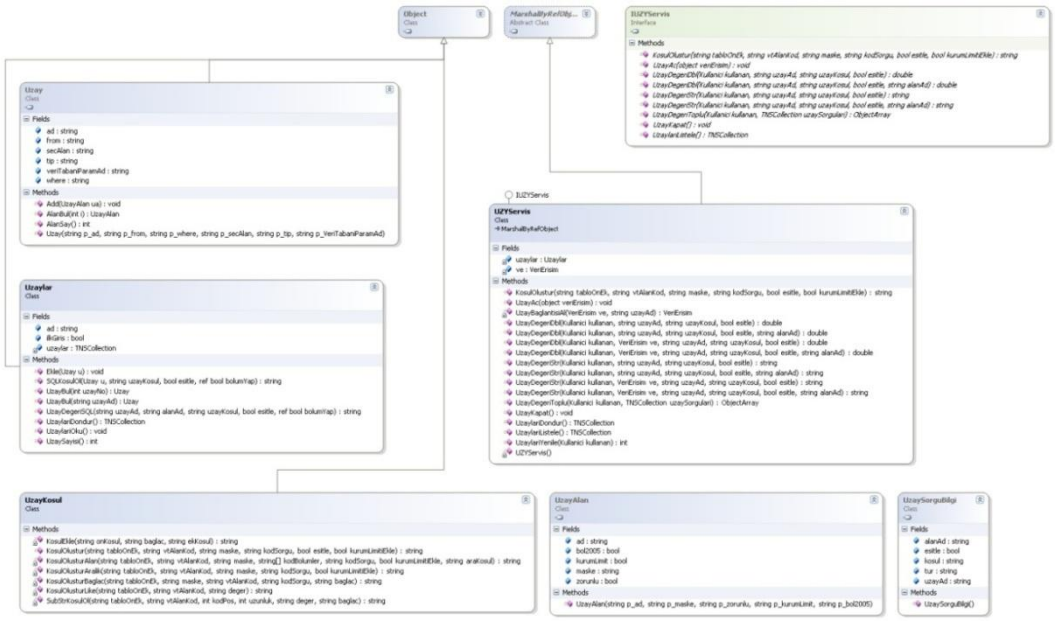

Figure 16. Public Financial Management Value Space Class Diagram

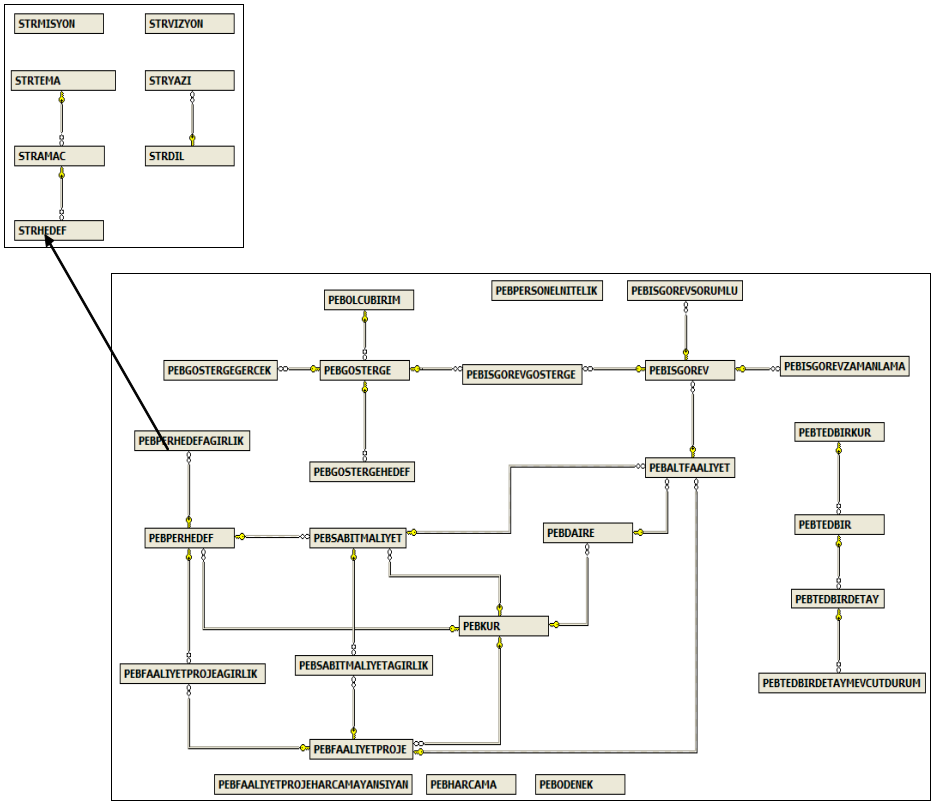

Figure 17. Performance Based Budgeting Object Model

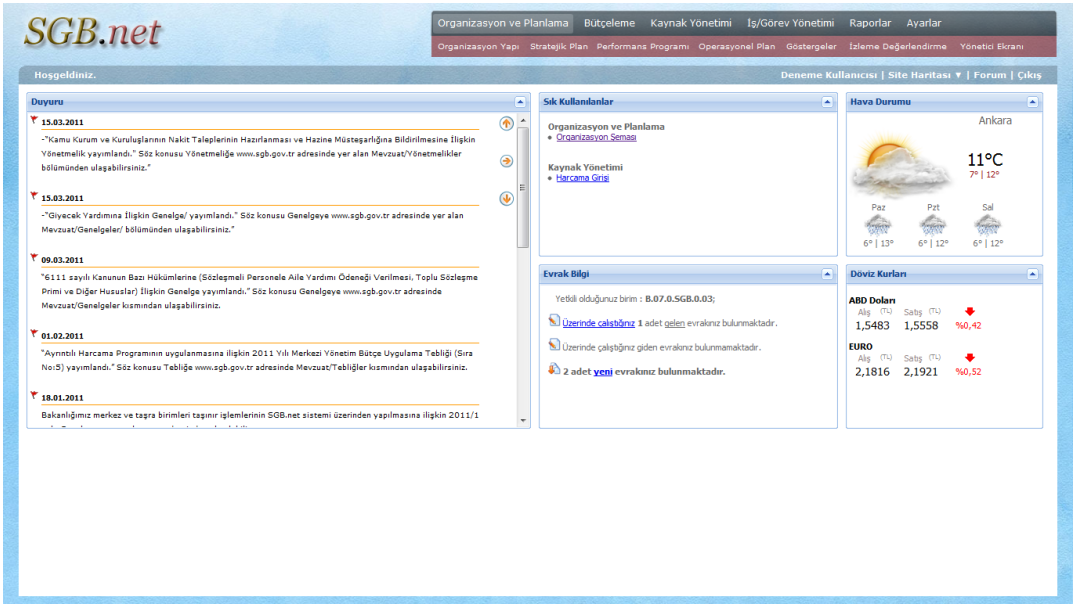

Figure 18. SGB-Net: Work Space after Login

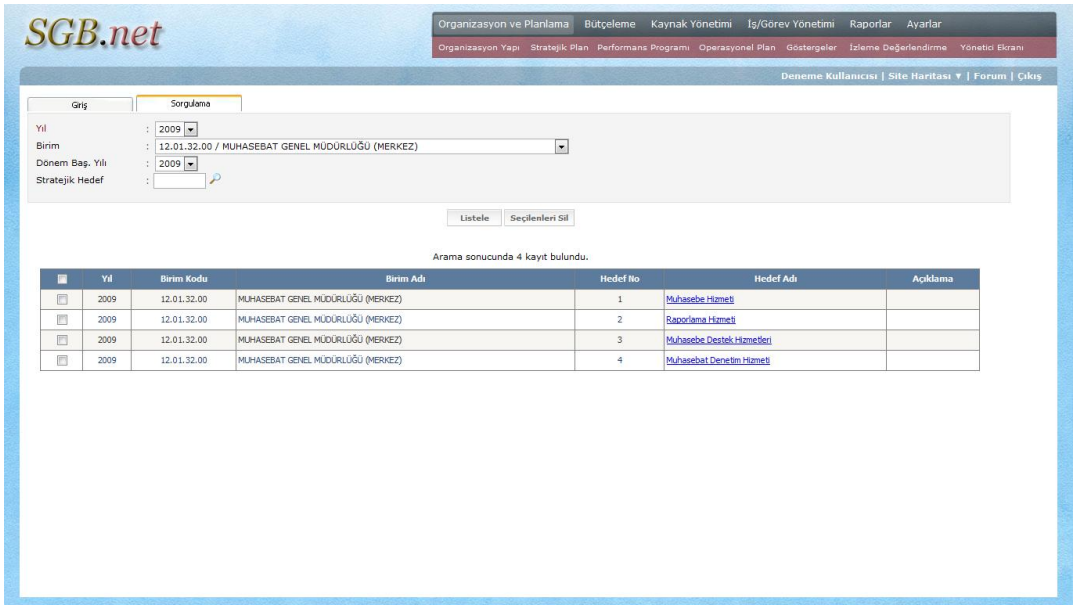

Figure 19. SGB-Net: Definition of Objectives for a Selected Spending Unit

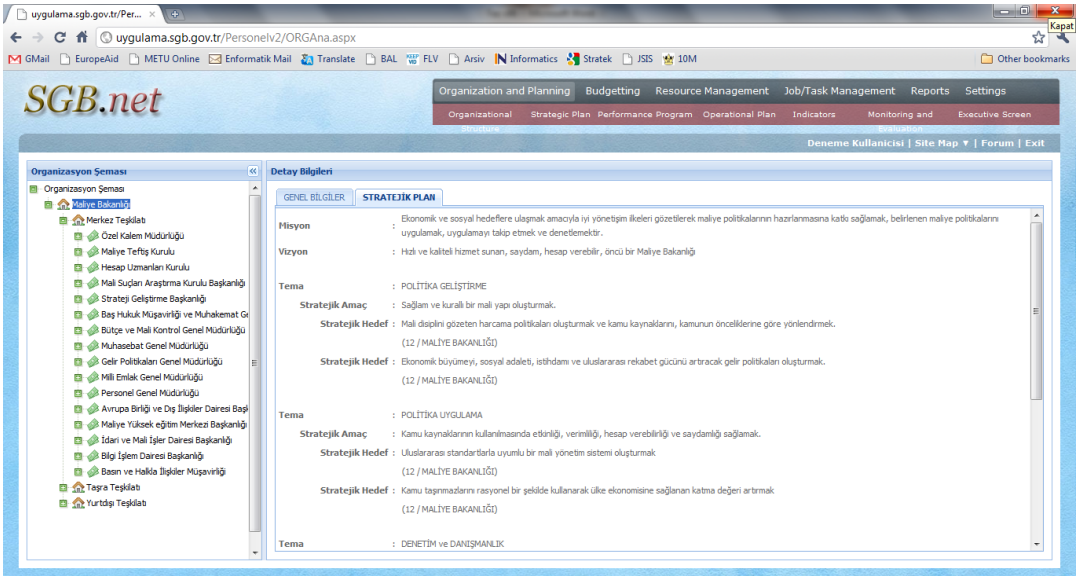

Figure 20. SGB-Net: Strategic Plan Linked with Organizational Structure

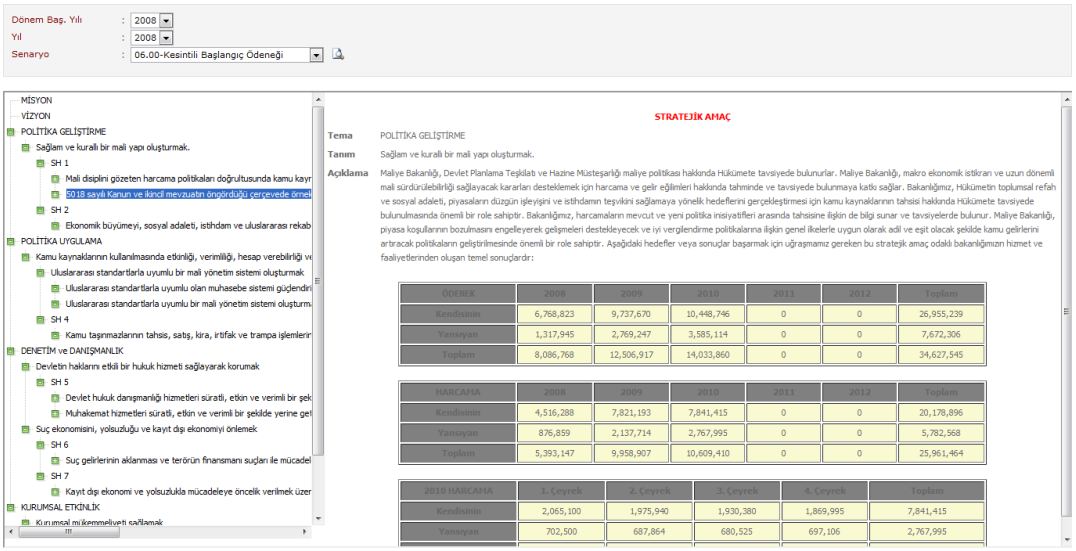

Figure 21. SGB-Net: Detailed Strategic Plan with Budget Dimensions

APPENDIX C.

OVERVIEW OF STEPS METHODOLOGY

Table 9. STEPS – Knowledge Management Methodology Based on Business Processes v3.1

Process	SubProcess	Function	Purpose	Activities & Tasks	Inputs	Outputs
A.1. Mobilization						
	A.1.1.Mobilization		Mobilization of project personnel	E.1. Reach Agreement / Obtain Approval about Project Scope, Resources, Facilities and working / physical conditions, logical & physical access requirements & their identification. E.2. Settlement and establishment of physical project office	– Draft Contract	– Legal & Formal Deal basis set-up completed – Office and staff in place
	A.1.2.Orientation and Commencement		Orientation of management and working groups	E.3. Presentation of project approach and change methodology; ensuring executive management contribution and commitment E.4. Agreement upon Project Deliverables and Expected Side Benefits. E.5. Investigation of existing plans and reports E.6. Contact with the existing workgroups, establishment of new work groups E.7. Orientation of work groups	– Business Problem – Management time and support – Project sponsor/owner – Project Manager – Assignment of Steering Committee member – Announcement of the project – Assignment of workgroups, delegation of responsibilities and authority – Time of work groups – Proper working office environment – Access rights to the resources such as personnel and documentation – Support	– Management support – Oriented work groups – Project Commencement Report (R-SyPMP) – Risk Analysis Report (R-SyRMP)
A.2. Definition in Business Terminology						
	A.2.1. Strategic Planning		Development of strategic plan based on vision	E.8. Determination of the agreed enterprise vision statement for change E.9. Determination of and agreement on strategic goals based on the vision E.10. Determination of measurable goals E.11. Determination of Measurement Metrics E.12. Determination of strategies E.13. Determination of policies and regulations E.14. Brainstorming sessions	– Time of work groups – Proper working office environment – Access rights to the resources such as personnel and documentation	– Strategic Plan Report (R-SP) • Vision statement • Measurable goals • Strategies • Policies and regulations – Brainstorming Session Report (R-BS)

Table 9 (continued)

Process	SubProcess	Function	Purpose	Activities & Tasks	Inputs	Outputs
	A.2.2. Process Engineering	A.2.2.1. AS-IS Modelling (IPE, ARIS)	Development of AS-IS Process Model or evaluation/revision of existing models	E.1. Development of integrated process models in different views E.1.1. Organizational view (organigram, central and provincial) E.1.2. Functional view (function tree, function allocation diagram). Business functions E.1.3. Data view (eERM). Data usage E.1.4. Process/Control View (eEPC). Flow patterns, rules and events E.1.5. Output view E.2. Determination of existing enterprise structure, problems and deficiencies E.3. Development of performance indicators E.4. Determination of existing assets and resources (people, material, financial, facilities, knowledge) E.5. Consolidation of findings and development of AS-IS model report E.6. Investigation of sociological and psychological structure of personnel regarding the change E.7. Determination of training structure of personnel	– Management time (active participation and support) – Time of work groups – Proper working office environment – Access rights to the resources such as personnel and documentation	– AS-IS Model Report (R-ASIS) • Processes, tracking mechanisms for change in structure and assets • Performance indicators • Deficiencies, bottlenecks • Decision mechanisms • Sociological and psychological structure of personnel regarding the change • (if possible) Benchmarks / AS IS maturity level compared to global best practices
		A.2.2.2. TO-BE Modelling	Development of TO-BE model based on Strategic Plan	E.8. Determination of bottlenecks and deficiencies in existing processes E.9. Development of reporting and management requirements E.10. Development of knowledge flow maps E.11. Revision or redesign of organizational, data, function, process/control and output views E.12. Development of organizational structure, role/task definitions based on processes E.13. (if possible-applicable) Cost/Benefit or Savings Justification of TO BE vs. AS IS E.14. Contribution to the evaluation based on international standards and best practices	– Active participation and decision making – Time of work groups – Proper working office environment – Access rights to the resources such as personnel and documentation – Active participation on acquisition of international standards and best practices (legal and technical)	– TO-BE Model Report (R-TOBE) • TO-BE processes • Functional specifications • Human Resources management architecture (roles, authority-responsibility) • Performance system • Training strategies • Public relations strategies • Knowledge management strategies • MIS architecture • Asset requirements • Decision making mechanisms • Quality management system • Legislative change requirements • Security requirements • Physical infrastructure requirements • Standards
	A.2.3. Gap Analysis and Planning for Transformation		Strategic planning and determination of related IT, legal framework and technical development requirements in transformation from existing organization to knowledge organization	E.15. Evaluation of Alternative Recommendations (SWOT; Pros-Cons) E.16. Determination of transformation steps in organizational change E.17. Capacity building (material and people) E.18. Determination of staffing and training requirements and solutions E.19. Determination of physical infrastructure (office space, equipment, etc.), software, and hardware requirements E.20. Determination of process(es) for pilot implementation [if applicable] E.21. Budgeting and development of acquisition strategies for determined requirements E.22. Realization of conformance works E.23. Determination of sociological and psychological effects of change and development of alternative solutions E.24. Regulative changes; assistance in dev. of draft regulations	– Support of technical domain experts – Active participation and decision making – Leadership and primary responsibility in determination of technical development requirements – Active participation, leadership and primary responsibility in development of new regulative framework – Promotion of change requirement, presentation to executive management and political level management – Time of work groups – Proper working office environment – Access rights to the resources such as personnel and documentation	– System Requirements Specification (R-SyRS) • Organizational transformation and action plan (R-AP) • Staffing and training requirements, training plan, curriculum (R-SyTrP) • ICT Strategic Plan (R-SP) • Test/Pilot Study results, if applicable • Deployment and Operations Plan (R-SyDOP) • Establishment of, renewal, and/or development of physical infrastructure • Draft regulations (R-L&R)

Table 9 (continued)

Process	SubProcess	Function	Purpose	Activities & Tasks	Inputs	Outputs
A.3. Description in Terms of Technology and Implementation						
	A.3.1. System Engineering (ISO 15288)					
		A.3.1.1. Project Management	Planning and tracking to ensure business aligned system solution	E.1. Plan E.2. Track E.3. Update	– R-SyRS	– Project Management Plan (R-SyPMP) – Risk Management Plan (R-SyRMP)
		A.3.1.2. Quality Management	Planning and tracking to ensure system solution quality	E.4. Track E.5. Update E.6. Joint review E.7. Validation and verification	– R-SyRS	– Quality Management Plan (R-SyQMP) – Joint Review Reports (R-SyJR) – Validation and Verification Reports (R-SyV&V)
		A.3.1.3. Configuration Management	Determination and tracking of system solution components	E.8. Plan E.9. Determination of system solution components E.10. Change management E.11. Update	– R-SyRS	– Configuration Management Plan (R-CMP)
		A.3.1.4. Technical Infrastructure Development	Design and implementation to ensure business aligned system solution	E.12. System design E.13. Development of Technical specifications, term of reference	– R-SyRS	– System Design Description (R-SyDD) • System design • Test plan (R-SyTP) • Test cases (R-SyTC) • Training plan (R-SyTrP) – Technical specifications, Terms of Reference(s) (R-TOR)
		A.3.1.5. Software Development (ISO 12207)	Design, implementation, integration and testing of software to ensure alignment with business requirements	E.14. Determination of software requirements E.15. Software design E.16. Deployment, installation, configuration and (inter-modular and intra-modular) integration of software components E.17. Software Project, Quality, Configuration/Change Management	– R-SyRS – R-SyDD	– Software Plans • Project Management Plan (R-SMP) • Risk Management Plan (R-RMP) • Configuration Management Plan (R-CMP) • Quality Management Plan (R-QMP) – Software Requirements • R-SDD • R-STP • R-STrP – Software Design • R-SDD • R-STP • R-STC • R-STrP – Integrated Software - tested and documented – Software Source Code (R-SSC) – Software User Manual (R-SUM) – Software Technical Manual (R-STM) – Software Test Reports (R-STR)
	A.3.2. Acquisition Management		Consultancy in acquisition of determined technical infrastructure	E.18. Collection of bids E.19. Bid evaluation E.20. Contract consultancy E.21. Control and acceptance E.22. Operational planning	– R-TOR	– Contract – Operational System
	A.3.3. Integration		Deployment, installation, configuration and integration of developed or acquired system solution components	E.23. Inspection and acceptance E.24. Security Audit	– Contract – R-DOP	– Secure integrated system – R-SyUM – R-SyTM – R-SyTR – Trained users – Supplier consultant and technical experts
A.4. Sustain						
			Revision and finalization of Strategic Plan, track and control implementation steps of Action Plan	E.25. Consolidation, revision and presentation E.26. Continuous control, development of recommendations at the management level E.27. Orientation of work groups E.28. Revision of Action Plan based on changing environments	– Active participation in revision and acceptance – Active existence of work groups – Evaluation of recommendations and putting in practice – Tracking of Action Plan – Management contribution	– Revised R-SP covering R-DOP – (If applicable) Revised R-AP, R-SyRMP, meeting minutes

CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: Güçlü, Aydın Nusret

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EDUCATION

Degree	Institution	Year of Graduation
MS	METU EEE	1985 (high honours; 3 semesters)
BS	METU EEE	1983 (high honours)
High School	Bornova Anadolu High School, İzmir	1979 (53rd in the university entrance exam)

WORK EXPERIENCE

Year	Place	Enrolment
Jul 1996 – present	TNS Information Technologies	Founding Partner Company Manager Senior Advisor Consultant/advisor to MoF
Aug 2002 – present	Stratek Strategic Technologies R&D	Founding Partner Company Manager Senior Advisor
1999 – present	METU Informatics Institute	Part-time faculty
2001 – present	Defence Sciences Institute, KHO	Part-time faculty
2005 – present	SATEM	Part-time instructor
Dec 1992 – Jun 1996	Halici Group	General Manager, Software
1989 – Sep 1992	IBM Australian Programming Centre	Program Manager Finance Industry Products
1988 – 89	Epson Australia	Product Development
1986 – 88	Romar	Software Coordinator
1986 – 87	METU	Part time instructor
1983 – 86	TUBITAK & METU	Research assistant/engineer

MAJOR PROJECTS UNDERTAKEN

1. Team Leader. Public Financial Management Modernization Project. Consulting Services on Developing Functional Requirements and Technical Specifications for Improving the Information Systems on Budget Preparation and Execution, Tajikistan, World Bank.
2. Project owner, senior expert. Development of management model and ontology for eGovernment services in Turkey.
3. Project owner, senior advisor, MoF. Development of performance management and decision support models for the public finance in Turkey.
4. TNS project owner, Senior Consultant and Technical Contact for approvals, Strategic Planning for PTT, Turkish Post. Development of 10 year Strategic & Action Plan. The project focuses on identifying PTT operational processes, organization, human resources, governance on postal services, logistics, and banking.
5. Senior expert. Development of IT Strategic Plan for Erzincan University, Turkey.
6. Senior expert. Development of IT Strategic Plan for the Presidency of Religious Affairs, Turkey.
7. Expert. Development of Technical Specifications for the "Procurement of Equipment for Country of Origin Information System, EuropeAid/125354/D/SUP/TR"
8. Senior Consultant. Presidency of Religious Affairs. Strategic Management and ICT.
9. Senior Consultant, Undersecretariat of Customs. Strategic Planning and development of Action Plan.
10. Consultant to Undersecretariat for Defence Industries (SSM) on Homeland Security.
11. Strategy advisor to STM on defence and border management.
12. QA Team Leader, quality management. Development of Integrated Financial Management Information System for the government of Syria. EuropeAid/124503/D/SUP/SY.
13. Stratek Team Leader and project owner for the development of Strategic Management Model for the MoF to be used in all Turkish public agencies. Strategy management advisor to the MoF. Modeling and Development of Strategic Management System and Performance Based Budgeting for the Turkish Public Sector. Development of architecture and associated projects. In use at more than 80 public agencies in Turkey. Development of projects to support PFIC. Multiple contracts within the same period, as extensions.
14. Local team leader, Process and Training expert,. Technical Assistance for Development of a Training System for Border Police TR0404.04.002.

15. Expert, UNODC. Strengthening border control along the Turkmen-Afghan border, in particular at Imam-Nazar checkpoint for Turkmenistan. AD/TKM/I78
16. Consultant. (EU) Development of the Project Fiche for "Development of the Legal and Institutional Capacity for Integrated Border Management (IBM) and Detailing the Action Plan of the new IBM Strategy"
17. Strategy management advisor to the Ministry of Finance. Definition and Development of projects. Senior consultancy on the Strategic Management System, covering all aspects from Strategic Planning to Integrated Public Financial Management, and Performance Management. Consultancy on process analysis, requirements elicitation and risk management for the SGB Net, the Public Financial Management platform and applications for the MoF. Projects on Expenditure Management, Internal Control and IT Governance.
18. External evaluator, voting member. (EU) EuropeAid/121200/D/SV/TR, "Technical Assistance for Restructuring and Strengthening of the Food Safety and Control System in Turkey".
19. Project manager and owner, senior consultant (WB) "Consultancy Services For Design of Management Information System, Projects Coordination Center, Ministry of National Education, Turkey. Process based analysis, System Design, development of technical specifications, evaluation and supervision.
20. Consultant. (EU) Project TR 0402.04, Twinning TR/2004/IB/OT/01. Development of Technical Specifications for Intellectual Property Rights.
21. Consultant. (EU) Project TR 0403.10, Twinning TR/2004/IB/FI/05. Development of Technical Specifications TA and Supply contracts for Board of Treasury Controllers, including knowledge/process management and CAATT.
22. Management consultancy, (EU) MASAK (Financial Intelligence Unit), Turkey.
23. TNS project owner, senior consultant (WB) Turkish Patent Institute, Consultancy for Turkish Patent Institute. Republic of Turkey Industrial Technology Project, Loan No: 4495-TU Bid No: TPI – 08, Consulting Services for Customization of International IPR Organisations' IT products (WIPO, EPO, OHIM).
24. Management consultancy and Development and operation of multi-year eBudget System for Public Financial Management, GD of Budget and Fiscal Control, Ministry of Finance
25. Consultancy and liaison. (EU) Design and programming of a Management Information System for the Reporting on EU financed programmes in Turkey.
26. Project manager, process management consultancy, Local government financial management system. Municipality of Çankaya, Ankara, Turkey

27. Training. ANT and TAI on process design towards development of technical specifications.
28. Analysis and development of technical specifications for the Intellectual Property and Cinema GD of Ministry of Tourism and Culture.
29. Local Team Leader, IT Expert. (EU) TA for the Project “Strengthening the Fight Against Money Laundering” Etortop/001/NPAFAP/TR/CIB, developing Tender Dossier
30. Senior management consultant. Reporting to deputy CEO, Isbank. Business-IT alignment, IT processes, roles and descriptions, change management,
31. Team Leader, senior process and IT consultant (UNDP & WB). Direct Income Support, ARIP. Development of technical specifications of the National Registry of Farmers, evaluation of the proposals.
32. Training. Custom training for technical staff of the Is Bank on the business-IT alignment.
33. Project manager, senior consultant. TUBITAK R&D Project, Agri-Knowledge Management, AgroPort.
34. Management consultancy and Development and operation of GFS based BYES eBudget Management System, GD of Budget and Fiscal Control, Ministry of Finance
35. TNS team leader, senior consultant. Functional design and restructuring project of Criminal Police Laboratories.
36. Project manager, senior consultant. (PTB, Germany) Reorganization of and development of MIS for the General Directorate of Measurements and Standards.
37. Project manager. Methodology consultancy and social security and pension funds system software development for Oyak.
38. Project co-manager. Development of the technical specifications and evaluation criteria for a large scale military intelligence project.
39. Project manager, consultant. (WB) Regional development project, the Aegean Economic Development Foundation (EGEV) Regional Portal. SME Training on e-business.
40. Consultant ((WB, SweRoad). Development of the functional specifications and the ToR for the Traffic Safety component of the Highway Information System.
41. Project manager. Consultancy and software development at the Ministry of Tourism, development of technical specifications. Development of software infrastructure for the official tourism portal.
42. Local team manager. (WB, Barents/KPMG) Information System Design Consultancy, Public Financial Management System, Ministry of Finance. AS-IS/TO-BE process design/modelling of the streamlined budget planning

and execution system, and public accounting. Development of technical specs.

43. Management consultancy, T-Mobil of Deutsche Telecom and DataSel.
44. Project manager. Development of the IT Strategy for the General Directorate of Forestry.
45. IT & Operations Consultancy. Gazi Faculty of Dentistry, Ministry of Agriculture and Rural Affairs, Youth and Sports GD, Board of Inspectors of Finance, Account Inspectors, Turkish Telecom, Turkish Presidency, Turkish National Olympics Committee, Ankara University Faculty of Dentistry, Turkish Railways, Turkish Treasury, Is Bank.
46. Interim IT Head for Central Fiscal Authority, Kosovo Interim Government.

OTHER SKILLS & EXPERIENCE

1. Teaching: Teaches MSc and PhD level courses on Knowledge Management, Process Management, Process Engineering, Object Oriented Systems / Java, and Information Systems Security at the Informatics Institute, Middle East Technical University, Defence Sciences Institute, Turkish Armed Forces, and the Defence Sciences Training Command.
2. Foundation certification in IT Service Management: EXIN, Quantum; Certificate #: 203666-873.
3. Development of eGovernment services ontology and eGovernment Interoperability Framework for Turkey (published as Prime Ministry decree; first in 2005 and current version in 2009).
4. Development of Financial Plan for Integrated Border Management (published as Prime Ministry decree; 2005).
5. Countries worked in: Australia, Kosovo, BiH, Syria, Tajikistan, Turkey, Turkmenistan

FOREIGN LANGUAGES

Advanced English

PUBLICATIONS

1. Guclu, A.N. & Bilgen, S. (2011). Modelling and Assessment of the Effectiveness of Government Information Technologies - Value Space Approach with a Public Sector Case Study in Turkey, Electronic Journal of Information Systems in Developing Countries. 45, 4, 1-30. http://www.ejisdc.org/ojs2/index.php/ejisdc/article/view/734/346
2. Sonmez, V.N., Canli, M., Gokce, S., Unver, M. & Guclu, A.N. (2010). Ontology Driven Government Services Inventory and Business Process Management. Bider, I. et al., eds. Enterprise, Business-Process and Information Systems Modeling. Berlin, 2010. Springer-Verlag.

3. Guclu, A.N. & Bilgen, S. (2010). Process Based Public Value and Effectiveness of Government Information Systems. Proceedings of the International Conference on Research Challenges in Information Science, 425-431, RCIS IEEE 2010. Nice, France.
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5. Guclu, N. (2008). Process Interoperability, Key Note Speech. Ankara, 2008. Turksat eGovernment Conference.
6. Guclu, A.N. (2006-2008). Strategic Management Model. Ministry of Finance, Turkey.
7. Guclu, A.N. (2006). Knowledge Management Framework for Public Finance, Presentation to Jerzy Buzek. Brussels: Ministry of Finance, Turkey.
8. Guclu, A.N. (2003-2006). STEPS – Knowledge Management Methodology Based on Business Processes v3.1. TNS Information Technologies, Ankara, http://tns.com.tr/STEPS_v31.pdf.
9. Guclu, A.N. & Arslan, S. (2005). Integrated Border Management in Turkey - Principles and Overview of the Technology Architecture with Reference to the Action Plan. The Second IEEE International Conference on Technologies for Homeland Security and Safety. TEHOSS 2006.
10. Guclu, A.N. & Guner, E. (2003). The Impact of Information Technology and Particularly Geographic Information Systems on the Battlefield. KHO.
11. Guclu, A.N. & Çelik, A. (2001). e-business at the Ministry of Tourism. Bilişim 2001.
12. Guclu, A.N. & İnan, E. (2000). Public Budget, A Control Mechanism of the Citizens - IT Infrastructure for the Preparation and Execution. Bilişim 2000.
13. Guclu, A.N. (1999). Evaluation and Selection. Bilişim 1999.
14. Guclu, A.N. & Özgüler, B. (1986). Diagonal stabilization of linear multivariable systems. International Journal of Control. 43, 3, 965 – 980.

M.Sc. Theses Supervised/Co-supervised:

1. An Approach for Eliciting Functional Requirements of the Software Intensive Systems Based on Business Process Modelling, Okan Yıldız, METU, Aug 2002.
2. Using Information and Communication Technologies as an Organizational Change Enabler: A Case Study In Criminal Police Laboratories of Turkey, Bahadır Akçam, METU, Dec 2001.
3. Content and Application Management Framework for the Web, Onur Mat, METU, Sep 2001.

Projects Supervised:

1. A Web Based Solution for an E-Learning Management System: SDLC with Business - Software Requirements Segregation; and MVC Design Pattern, Serkan Turhal, ION 589 MS PROJECT, METU, Jun 2005.

HOBBIES

Reading, swimming, improvising in cooking