



A Conceptual Framework of CIO Competence: Towards A Pedagogical Tool for IT Management Education

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ABSTRACT

Managerial responsibilities for information technology (IT) have, increasingly, been consolidated in the person of the "chief information officer" (CIO). Despite the increased prevalence of the CIO position, no one model has emerged that explains what can realistically be expected of the CIO in various organizational contexts. This exploratory research develops a conceptual framework of the critical competencies for CIOs in public sector agencies. This paper positions the conceptual framework as a useful pedagogical tool in information management curricula. Six dimensions comprise the conceptual framework: three knowledge-based (business factors, technical factors, and human factors); three activity-based (conveying the relevance of IT, managing critical relationships, and implementing IT-based solutions).

This study addressed the following research question:

1. *What are the dimensions of CIO competence?*

INTRODUCTION

Over the past two decades many organizations, private and public, have come to rely on their information base as a critical asset. Michael Dubose, CEO of Aftermarket Technology Corporation states, "...information access and flow is absolutely critical to today's businesses" (Prince, 1999: 66). The need to better harness the power of information has increased organizations' reliance on information technology (IT). This phenomenon is spanning the private and public sectors. IT and the information infrastructure it supports have become critical components in the management and operations of modern organizations (McKenney et al, 1995). The Department of Transportation's CIO, George Molaski states, "IT has become an integral part of virtually all transportation systems. Successful mission performance is now heavily reliant on IT" (Hickey, 1999:43).

As the cost of IT relative to processing power improves dramatically, the overall organizational expenditure on IT continues to rise. This phenomenon has caused many organizations to rethink their management of information, the requisite IT, and the associated costs. Managerial responsibility for these processes is increasingly being consolidated in the person of the *chief information officer* (Dodaro, 1997; Stephens, 1995).

William Synott defined the "chief information officer" (CIO) as the "senior executive responsible for establishing corporate information policy, standards, and management control over all corporate information resources" (Synott & Gruber, 1981: 66). Twenty years later, organizations have run the gambit in attempting to correctly implement the position within the context of their specific environment.

Interdisciplinary IT Management Pedagogy: Where Do We Start?

Despite the insight gained from past CIO research "no one model is emerging for the CIO and supportive organization" (Penrod et al 1990: 9). For example, John Thomas Flynn, CIO of the state of Massachusetts since 1994 explains, "There was no model in state government for CIO when I took the position... I ended up modeling my job after the position at General Motors, which had divisional information officers report to the CIO" (Newcombe, 1999: 12). The lack of the CIO position within public-sector agencies, until relatively recently, may stem from chief decision-makers who are uninformed as to what the CIO position is about. Flynn expounded on his situation by

saying he "...had to explain to [his state's] Gov. William Weld what the [CIO] title meant" (Ibid.).

Determining the appropriate role of IT and the CIO has become critical to organizational success and dictates serious consideration of curriculum development for training the next generation of IT managers specifically and information professionals in general. Admittedly, research in this area is difficult due to the constant influx of IT innovations, as well as changes in organizational strategies and management objectives. The *appropriate* approach to managing information resources continues to evolve. Some approaches that have proved effective in the past often hold little relevance in present situations.

The approach here is to elucidate that which is relatively static in a domain that is increasingly dynamic. Specifically, this paper develops a conceptual framework of CIO competence comprised of dimensions of the role that will likely endure over time. CIO competence is viewed broadly in terms of: 1) what *all* CIOs should know, and 2) what *all* CIOs should be able to do.

RESEARCH METHODS

This research is based on data collected through exploratory in-depth interviews. All interviewees worked within New York State government agencies and were the individuals foremost responsible for management of their agencies' information resources. A noteworthy aspect of this study is that it follows the admonishment of Graham T. Allison in his *Lessons for Research in Public Management* (Allison, 1980). One of Allison's lessons was applied here:

1. The effort to develop public management as a field of knowledge should start from problems faced by practicing public managers.

The exploratory in-depth interview data were examined to determine the key problems facing public sector CIOs and to discern the requisite dimensions of the conceptual framework of CIO competence. These data resulted in a six-dimensional conceptual framework of competence in the CIO role (Figure 1). The following research question was addressed:

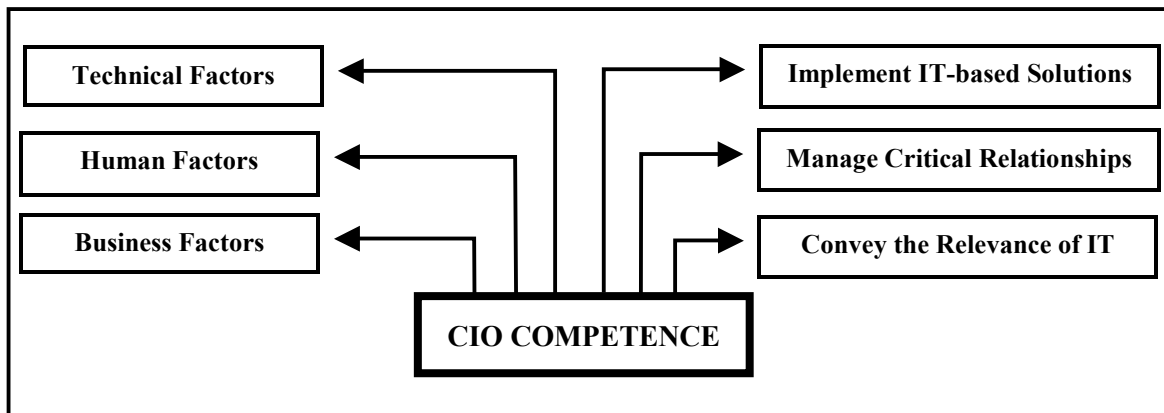
1. What are the dimensions of CIO competence?

RESULTS

Exploratory In-depth Interviews

The exploratory in-depth interviews represent one of the three lessons for research on public management from Allison's 1980 work, mentioned earlier, that were applied in this study:

Figure 1: Preliminary conceptual framework of CIO competence



The effort to develop public management as a field of knowledge should start from problems faced by practicing public managers.

Four exploratory in-depth interviews were conducted with New York State government agency CIOs. The interviewees were selected from a group known to faculty members of the University at Albany School of Business and Graduate School of Public Affairs programs. The four respondents represent agencies that are diverse in terms of budget, number of employees, age of the agency, structure, and the industry in which they operate. All of the interviews were conducted in person by the same interviewer, and lasted from 1 to 1.5 hours. The purpose of the interviews was to gain a richer understanding of the public sector domain in which NYS government agency CIOs operate and the common problems they deal with.

Responses indicate five categories of problems/challenges that these interviewees are confronted with. Below the categories are listed along with select problems/challenges within each:

1. Organizational Problems

- The CIO does not report directly to the top decision maker.
- The CIO is not perceived as a true member of the top management team.

2. Operational Problems

- The CIO does not actively participate in agency and program planning.
- Lack of standards and protocol to control end-user development.

3. Educational Problems

- Program managers are often not IT literate.
- Many are skeptical of the value of IT.

4. Resource Problems

- Agencies continue to manage the bottom-line to the exclusion of the top-line.
- Inadequate levels of central investment for IT and training.

5. Political Problems

- State elections and political appointments can radically change the agency agenda.
- Resource allocations are based on ineffective metrics.

Due to space constraints this section presents a *small set* of select quotes from the exploratory interviewees from which the aforementioned problem categories were identified. Also due to space (not importance), the discussion focuses on the *organizational problems*. Select problems within each category are discussed in support of the requisite six dimensions comprising the conceptual framework. The position here is that problems dictate managerial competencies and that this approach can be appropriately adopted for IT management pedagogical purposes.

Organizational Problems

CIOs do not report directly to the top decision maker. Most interviewees feel that the CIO is removed from the mainstream organization.

Where it is here (CIO position within the agency's chain of command) is not correct because of the buffer created by the current structure, which includes the associate commissioner. The head of MIS should report directly to the commissioner.

I'm more convinced than ever that an organization such as ours should have a much more substantial commitment from the agency. Reporting at a higher level goes right along with that.

The researcher followed up on this issue to determine why the interviewees felt the CIO, often, does not report directly to the top decision maker. The following problem was revealed.

CIOs are not perceived as true members of the top management team. The culture within the represented agencies is one in which the CIO and the IT unit are perceived as serving a support role, rather than a leadership role. As such, the CIO is not a true member of the top-management team. The following quote illustrates this point.

The traditional boardroom members perceive CIOs as 'techies,' second-class members of the boardroom. Speak when spoken to. The perception is that people in leadership positions in the IT unit are not boardroom material.

When the contributions of the CIO and the IT unit are viewed purely in a support capacity, IT is relegated to a reactive, rather than proactive posture. By the time the CIO's perspective is solicited, the strategy has often been set.

The researcher followed up on this issue to determine why the interviewees felt that program managers do not perceived the CIO as top management material. The following problem was revealed.

CIOs do not speak the language of the program heads and the top decision-maker. In all fairness to some top-management teams, CIOs have themselves contributed to the "second-class" status that they occupy in many boardrooms. The following quote is an indication of this sentiment.

With some exceptions, they [CIOs] are too technical. If I get too technical when talking to program heads, their eyes gloss over and I'm dead!

To combat this situation CIOs must exhibit competence regarding the business issues that managers from varying program areas deal with on a day-to-day basis. It is not that the CIO's technological knowledge is not valued. Rather, it is the manner, perceived or actual, that the CIO leverages technical knowledge with the business of the agency. This point is made in the following quote.

CIOs may not be technologists per se, but they need to understand the importance of technology for the business of what they are doing.

Underlying such an understanding dictates that the CIO remains up to date regarding the evolving *agency objectives and strategies*, as well as the technologies relevant to them. Competence in this regard is

reflected in the “**business factors**” and “**technical factors**” dimension of the conceptual framework.

Once program managers gain confidence in the CIO’s understanding of the business issues pertinent to the agency, they are more likely to solicit the CIO’s technical expertise. Prior research conducted in the private sector found that CEOs wanted a “CIO who could conciliate and diffuse. Someone who can eventually enthruse the top management team” (Feeny, Edwards, and Simpson, 1992).

Following this track, the researcher asked how the CIO might proactively leverage their technical expertise in a manner that garners top management support for their recommendations. The following suggestions were rendered:

A lot has to do with how you roll out your technology plan. If top management can see the relevance of it to what they’re trying to do, and you have a chance to brief them and explain as you go through the budgets and things, as to what it can really do for the institution, then you educate them in the process.

The notion that the CIO need act as an educator is expressed is reflected in the activities comprising the “**convey the relevance of IT**” dimension of the conceptual framework. Another interviewee went on to say:

In 1993, we basically proved to ourselves and those from where we get our financial support and our budget, that the proposed projects for 1994 were in fact workable, doable, and cost-effective. We had a lot of skeptics out there.

The idea that the CIO must overcome skepticism in order to gain support for proposed initiatives is captured in the “**manage critical relationships**” dimension of the conceptual framework.

Another CIO added:

The deployment of personalities, skills, and technology, trying to bring those three things together in a way that makes sense, and in which we gain support of people along the way so that we don’t force down their throats [IT] solutions that they are not comfortable with.

These data suggest that beyond the business and technological issues, the CIO must recognize that IT initiatives will have an impact on the end-user community. Understanding the people issues relates to the “**human factors**” dimension in the conceptual framework. The CIO’s ability to integrate a business focus with technical knowledge and an understanding of the social environment in order to successfully deliver IT-based solutions is exemplified in the “**implement IT-based solutions**” dimension of the conceptual framework.

It appears that in order to effectively engage in the activities comprising the three activity-based dimensions (i.e., convey the relevance of IT, manage critical relationships, implement IT-based solutions), the competent CIO needs to rely on the information comprising the three knowledge-based dimension (i.e., business factors, human factors, technical factors). Conversely, it’s not just what the CIO knows that exemplifies competence in the role. Rather, competence relates to what CIOs do with what they know. Leadership expert Warren Bennis makes the point well in stating, “Action without vision is stumbling in the dark. Vision without action is poverty-stricken poetry” (Nanus, 1990).

Due to space constraints the four remaining problem categories are briefly presented with sample quotes used to identify the associated category.

Operational Problems

The CIO does not actively participate in agency and program planning. Respondents indicated that the IT unit is treated as a separate organization within the larger agency.

There are agencies where the technology unit is so far away from the programs that they probably don’t know each other if they meet on the street, and that’s a problem.

The absence of the CIO in the strategy formulation process beyond IT reduces the potential reach and range of IT (Keen, 1991).

Also, this can result in the fragmented implementation of IT as exemplified in the following quote:

We also have many islands of computing external to this [IT unit] organization.

Lack of standards and protocols to control end-user development. Limited resources have caused a substantial backlog of service requests within the IT unit. Often, individuals and groups cannot wait and opt to take matters into their own hands.

Most managers must cobble together information on their PCs just to find out basic things like where their budgets are. So we have a long way to go. We’re not satisfied.

Unfortunately, quick fix solutions are often pursued in the absence of standards. Thus, the CIO is placed in the unenviable position of attempting to dictate how users must satisfy their own needs.

It’s a combination of the reality of the size of the organization, and the inability to have absolute standardization of data. We would like a much higher level of standardization.

We try to persuade our clients to apply good practices. When they don’t, we try to help them to survive with their own approaches and support them as much as possible.

Educational Problems

Program managers are often not IT literate.

People in the boardroom are unaware of what technology can do for them.

The challenge for the CIO is to effectively convey the relevance of IT and then help program managers make sound decisions regarding the agency’s information resources. The following quote provides insight into the why it is important for the CIO to engage in such educational processes.

It’s hard to say no when the CEO and senior staff say, ‘Wouldn’t you like to do this?’

Saying “no” becomes easier when it is accompanied by a logical explanation that is aligned with the agency’s business strategy. Furthermore, business leaders will be more receptive to hear the merits of the explanation when they are technologically sophisticated enough to understand the alternatives and their implications.

Resource Problems

Agencies continue to manage the bottom-line to the exclusion of the top-line. Organizations in both the private and public sectors have a tendency to focus on managing the bottom-line (what can we afford to invest), rather than managing the top-line (what can we ill-afford not to invest) with regard to IT (Keen 1991).

Unfortunately, in the public sector, your budget is a one-year thing. Most strategic changes take five to ten years, but you can’t guarantee your budget.

The Internet in my mind... is going to be the foundation of the National Information Infrastructure (NII). We’re saying we need to carefully architect ourselves so we can deal with that open architecture of anything to anything.

The information age is one where people are empowered by their technology, and technology has to be considered an enabling capacity. It gives you an opportunity for a great deal of innovation at the individual level. Everybody is not only a consumer, but [also] a provider.

The key words from the quote directly above are “enabling capacity” which suggest viewing IT as a means of achieving something that could not be achieved without the technology, as opposed to IT in a support capacity.

Inadequate Levels of Central Investment in IT and Training

Procuring adequate levels of funding for investment in IT is a major challenge in government agencies whether for strategic or support purposes. Nearly all of the interviewees stressed this point.

We’ve been trying for several years to move to the IBM system exclusively. It’s very hard in a state agency to get the financial backing necessary to make such a transition.

We don't have E-mail, five years ago we didn't have word processing, we don't have an HRM system. We just built a financial system. We're contractors and project managers and we've had virtually no project management tools.

There needs to be more central investment of resources for problem solving and coordination, data management, and networks.

One of the toughest things in the state of New York is that when budget times are tough, and there hasn't been a year in the last ten when they were not, the first thing to go is training and travel.

Political Problems

State elections and political appointments can radically change the agency agenda. Changes in state leadership, ushered in by elections and political appointments, often results in highly unpredictable and radical changes in leadership and agendas at the agency level.

One of my critical success factors is whether or not I'll keep my job after the new governor steps in. A lot of the guys and gals down the street will not, and that's not necessarily based on past performance.

We have to address the needs of various constituents internal and external to the agency that often have competing interests and objectives.

The CIO is often left chasing a moving target as they adjust to the change in leadership. Furthermore, because some of the old guard remains intact, the CIO must deal concurrently with old habits while attempting to adapt the agency to the infusion of new ones. Managing in such an environment means that the CIO must fulfill multiple roles that can be at odds with one another.

Resource allocations are made based on ineffective metrics. Unlike their private-sector counterparts, CIOs in the public sector are often not rewarded for saving their organizations money. Rather, they are in a sense punished by budget cuts in the next fiscal year, if they managed a surplus in the previous year. Consequently, the system encourages waste as evidenced in the following quote.

If you run a surplus this year, next years budget will be cut by that amount. So at year-end, what's the easiest way to avoid that? Invest in hardware!

The exploratory in-depth interviews provide a rich data set for better understanding the problems and challenges confronting CIOs in the public sector in particular, but insight can be gained into the CIOs position regardless of sector. The approach taken here of taking those problems and making inferences regarding the requisite CIO competencies is a logical first step towards conceptualizing competence in the role. A logical next step it seems is to explicate the specific competencies that underlie each of the six identified dimensions. This is the focus of future research.

CONCLUSION

This research provides insight into the landscape of public sector IT management. Further, the study demonstrates the usefulness of conceptualizing CIO competence in terms of 1) types of knowledge that CIOs should rely on, and 2) types of activities CIOs should engage in (Figure 2).

There are many contextual factors not considered here that will influence which of the six dimensions a given CIO will deem most important. Follow up research should more deeply examine the relationship between the contextual setting in which the CIO operates and perceived importance of the dimensions. However, the position of the researcher is that the six dimensions will generally be considered critical to CIOs, regardless of the contextual setting in which they operate.

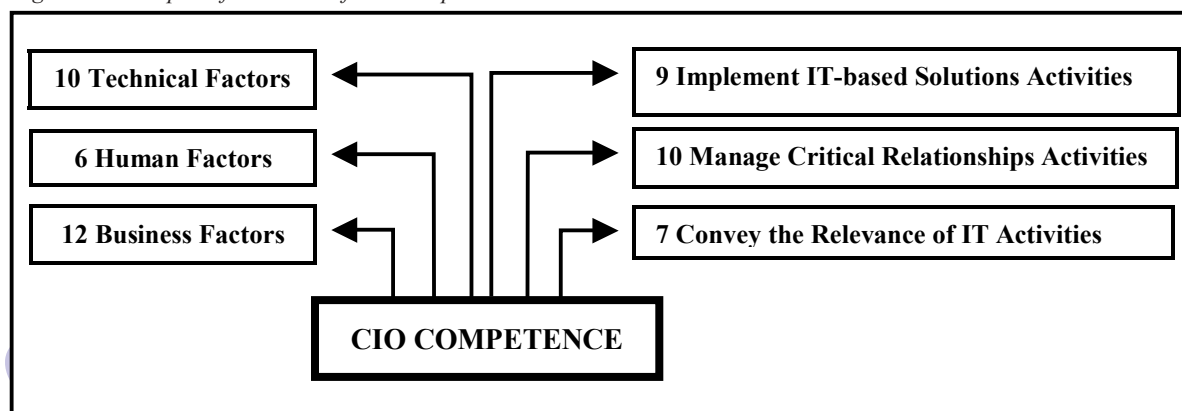
Alternatively, the conceptual framework of CIO competence developed here provides a comprehensive mechanism for framing curricula and stimulating discussions related to IT management, its challenges, and opportunities. A picture is worth a thousand words.

Too few organizations are fortunate enough to have as part of their work force individuals who possess an interdisciplinary and multi-dimensional perspective. In private-sector firms, this sort of employee is increasingly viewed as a critical resource and valuable asset to the organization. Public-sector agencies must more actively search for and develop such individuals. The need for more individuals that possess an interdisciplinary and multi-dimensional perspective, across sectors, is match only by the need for educational programs and approaches that competently and effectively satisfy this demand.

REFERENCES

References will be made available upon request.

Figure 2: Conceptual framework of CIO competence



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