Journal of the Association for Information Systems (2018) **19**(1)**,** 40-57
doi: 10.17705/1jais.00480

EDITORIAL

ISSN 1536-9323

From Project Management to Program Management: An Invitation to Investigate Programs Where IT Plays a Significant Role

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Abstract

Information technology is an inherent component of major change initiatives that organizations undertake. However, the increasing technological complexity involved in achieving the benefits of these change initiatives means that organizations must substantially revise management policies and procedures to create and deploy information technology across multiple functional areas and longer time horizons. Industries, governments, professional societies, and early researchers consider prior management practices inadequate and are moving toward practices that promote the integration of multiple functions, projects, environments, and stakeholders to best achieve the benefits of the chosen change. In this editorial, we discuss previous research, highlight key findings, and raise questions about the process of managing multiple projects in change initiatives that contain significant information technology—also known as program management.

Keywords: Program Management, Future Directions, Invitation for Research, Research Questions, Information Technology, Project Management.

1 Introduction

As the importance of information technology (IT) has expanded over the years, so too have perspectives on the deployment of nontrivial solutions in organizations. IT enables transformational initiatives that span an organization to capitalize on physical, personnel, and external resources. Such initiatives require long-term undertakings that include multiple projects managed cooperatively as a "program" (Artto, Martinsuo, Gemünden, & Murtoaro, 2009). However, many mistake such programs as merely large projects and inadequately manage programs using the practices of project management (Markus, 2004; Molloy & Stewart, 2012). Studies and practice recognize that treating program management as a variation of project management can lead to disaster (Lycett, Rassau, & Danson, 2004). Outside the IT field, researchers have long acknowledged the differences between the two concepts and studied and maintained their continual distinctions (Pelligrinelli, 2011). In IT research, we have only begun to consider program management despite the increased attention devoted to IT programs, which the increasing number of IT program director positions announced on employment websites such as LinkedIn indicates. In this paper, we raise, clarify, and emphasize the issues encountered in the management of programs where IT plays a key role.

Program management is increasingly important in developing and implementing systems that IT enables (Cunningham & Finnegan, 2004). IT need not be the reason for why the program exists, but it is often one means to enable resources dedicated to achieving organizational benefits. Programs with limited IT enablement might include customer outreach initiatives that rely more on commercial products and

media. Programs that rely more heavily on technology include multiple module enterprise systems, reactive IT infrastructure, collaborative technology work practices, and IT product lines. Each program has benefits that one cannot attain with IT alone, although the degree of IT requirements will vary. This inclusion of key non-IT functions affects the role of IT managers in programs, including their status, interactions, roles in governance structures, and all functions associated with achieving a program's goals and benefits. IT enablement in a program alters management roles and governance because employing technology to advance an organization can profoundly change internal processes, cross functional boundaries, involve technology risks due to instability and innovation in the field, raise concerns of sabotage and security, and generate social consequences from resistance and naiveté (Bernardi, Constantinides, & Nandhakumar, 2017; Markus, 2004; Seddon, Calvert, & Yang, 2010).

In this paper, we also promote the study of IT-enabled programs. We begin by identifying the boundaries of program management; in particular, we focus on programs that incorporate IT. By identifying these boundaries, we can systematically collect the literature to date from top IT publications to determine the specific topics that have received attention. We discuss these boundaries more fully to consider the work in other fields that are known to affect programs in general. A resulting model from that process will serve as a framework to describe issues, suggest research topics, and discuss possible theoretical views and methodologies for future studies.

2 What are Programs?

We first clarify the critical differences between portfolios, programs, and projects. Each of these topics is a unique field of study with minimal overlap, and both of the major project management professional societies (the Project Management Institute and International Project Management Association) recognize substantial differences between the three. Standards and certifications that reflect industry views and expectations outline these differences, and Table 1 summarizes the principal ones (Thiry, 2002).

Table 1. Distinctions between Projects, Programs, and Portfolios

	Project	Program	Portfolio
Target outcome	Clear deliverables	Defined business benefits	Organizational goals
Success measurement	Cost, time, scope	Achievement of benefits	Ongoing performance
Flexibility	Avoid changes	Capitalize on change	Change according to organizational strategy
Management role	Focus on tasks, product delivery	Pace and coordinate projects and benefits delivery	Resource allocation, value delivery to ownership
Control	Compare actuals to schedules, budgets, and product specifications	Comparison of delivered benefits to expected benefits	Comparison of total value to organizational performance indicators
Tasks	Define and complete work on deliverables, manage teams and risks	Coordinate projects and resources, market the program	Prioritize, allocate resources, continually assess value

The most specific entity, a project, has a set, limited scope with an identifiable deliverable. It is often considered a temporary organizational structure in an organization that has its own budget, governance, and dedicated resources. A project resists change to its focus on achieving a specific output in budget and schedule parameters. Project management has its roots in years of practice, standardization by professional societies, and a large body of available tools. Research clearly distinguishes projects as having unique objectives to those of portfolios and programs, so that following the wrong practice leads to failure (Malloy & Stewart, 2013). IT project management studies have a narrow view of projects as a standalone phenomenon (Elbanna, 2010). Studies on projects tend to draw most heavily from the product development literature, alongside knowledge creation and organizational design, as evident in the IT field's heavy focus on system development (Artto et al., 2009; Kelleher, 1995).

A program is a collection of projects and activities structured to achieve an expected benefit (e.g., improved financial performance or value creation) and that requires organizational change or transformation. As with projects, a program is often considered a temporary organization with dedicated resources and tailored governance practices that may differ from those of the permanent organization. Further, given that programs have flexible boundaries, they afford the opportunity to effect change. Programs might focus on

penetrating a market, elevating customer satisfaction, enhancing control over a supply chain, or deploying a complete quality system at multiple levels in an organization. Programs as a management device are increasingly important as the United States Senate has recently recognized via its Program Management Improvement and Accountability Act. Although programs and projects have certain concepts in common, a program is not simply a large project, a more complex project, a defined sequence of projects, or any extension of project management.

A portfolio contains all ongoing programs and projects, including those completed yet worthy of maintenance and updates. Executive management continually evaluates portfolios in order to achieve collective, strategic goals. Organizations allocate resources at this high level to the portfolio to meet the priorities of individual programs and projects. An IT portfolio supports all the new initiatives of an organization that use technology.

3 What are the Programs that are of Interest to IS Researchers?

Typically, such programs[1] reside in the organization and are exposed to the external environment. The programs must respond to organizational strategies and the external environment. The programs manipulate multiple projects, each of which may be completed, terminated, or commenced at any point during the program's progress. The projects have interdependencies, such as with goals and resources. Some projects have an IT focus, while others do not (and, thus, potentially cross many functional areas). Thus, a program directly interfaces with the organization, the environment, and its projects. Figure 1 illustrates these interfaces. Each interface has complexities that may deter the program from achieving its end goals. The relations at the interface points are potentially problematic and complex, and the interfaces occur at different levels in an organization and have different perspectives with regard to being permanent concerns (the organization and external environments) and temporary organizations (programs and projects that expire after they have achieved their goals).

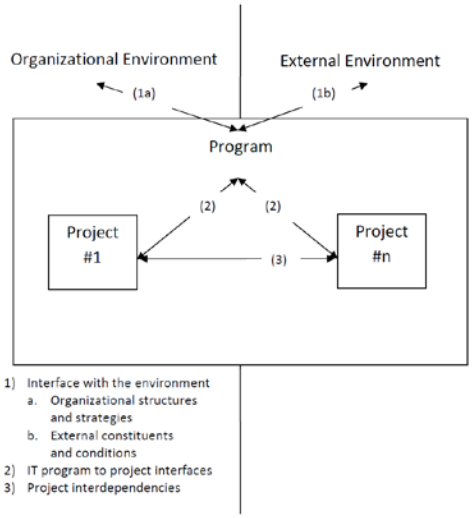

Figure 1. Interfaces that Affect a Program

Consider the construction of a bottom-up scenario in the IT world that includes implementing an enterprise system (ES) in a major organization. The organization may already have implemented ES modules to handle financial and asset management and be in the process of developing an ES module to handle customer relationship management. At this time, the organization may choose to implement a business intelligence module for advanced budget and performance reporting through executive dashboards. The project has a straightforward goal: to implement an additional module with select users as the primary stakeholders. The project's performance would likely be rated with traditional project success measures, including timely completion, whether it stayed in budget, and whether it delivered the promised product. However, the ES in its entirety would more represent the program. The goals for the ES might include integrating systems and improved information access to critical users across the entire organization. Projects in the program would include the various ES modules that move the organization toward the program goals. The specific modules would each be unique projects with focused goals, while the program would need to consider attaining goals focused on more global benefits. These more comprehensive goals would require implementation teams to select and time the individual module installations deemed most effective in attaining the defined benefits for the organization. Projects that involve more than simply installing a new ES module would be required to manage the aspects of social change required for success, such as training employees and coordinating business partners up and

[1] Henceforth, we use the term "programs" to represent programs relevant to the IS field (i.e., those that involve IT in some significant manner in affecting change).

down the supply chain. This program would be part of the organization's IT portfolio.

Thus, for our purposes, a program constitutes a collection of individual projects with multiple interdependencies that each has a common goal defined by organizational benefits, and these projects have an indispensable IT component among their cross-functional contexts. A pure IT program would include only projects focused on the development and deployment of technology that the IT function in an organization wholly managed. A program is IT-enabled when it requires an IT foundation to realize the benefits, but such a project will span projects beyond those that depend on technology and will involve multiple functional areas in an organization. The goals, means, and participants of a program extend beyond a single functional area.

To develop the remaining discussion, we consider the current, mainstream thought on programs in the IT literature. To locate the relevant literature, we employed a systematic search via Scopus of the journals in the Association for Information Systems Senior Scholars' basket of eight: *MIS Quarterly* (*MISQ*), *Information Systems Research* (*ISR*), the *Journal of Management Information Systems* (*JMIS*), the *European Journal of Information Systems* (*EJIS*), the *Journal of the Association for Information Systems* (*JAIS*), *Information Systems Journal* (*ISJ*), the *Journal of Information Technology* (*JIT*), and the *Journal of Strategic Information Systems* (*JSIS*). For keywords, we used the terms in Table 2 that encompassed program management, including terms employed as synonyms in recent years. Certainly, additional terms may reveal other studies on program management since papers may describe programs without using the term "program" or focus on project management (e.g., Carugati, Fernández, Mola, & Rossignoli, 2018); indeed, so would a search on journals outside the basket of eight. However, the examined papers were sufficient to drive much of our discussion. Table 2 indicates the number of papers that we located and identified as pertinent as constrained by the definitions in the prior section; we removed duplicates. Table 3 lists and briefly describes the remaining papers.

Table 2. Summary of IT Literature Search

Keyword	Located	Pertinent
Program* or programme*	217	19
Multi* project*	10	3
Major project*	2	1
Mega project*	1	0
Large project*	2	0
Complex* project*	5	1
Strategic project*	3	0
Total	240	24

Table 3. Relevant Papers Identified by Keyword Search

Paper	Journal	
Pouloudi, Currie, & Whitley (2016)	*JAIS*	Alliances, attitudes, and roles shift over the course of a program. Implications regarding stakeholder management and controls during program governance. A longitudinal case study using a stakeholder theory lens.
Gregory, Keil, Muntermann, & Mähring (2015)	*ISR*	Conditions exist in an organization that create paradoxes between program and project perspectives and approaches. Resolving these paradoxes requires program management to adopt an ambidextrous approach. Implications for organizational context and program governance. A grounded theory study that focuses on developing a substantive theory of ambidexterity in programs.
Jiang, Chang, Chen, Wang, & Klein (2014)	*JMIS*	Resource interdependence positively affects program performance by enhancing promotive interaction behaviors among program members. A quantitative study rooted in social interdependence theory.
Elbanna (2013)	*EJIS*	A strategic transformation program can deprive others of top management support. Implications about the conditions in the organization and interdependence among projects or programs. A case study following actor-network theory.
Rose & Schlichter (2013)	*ISJ*	In enterprise resource planning implementations, stakeholder trust levels vary as the implementation goes through smooth and difficult phases. Governing the relationships suitable for various conditions in the environment is necessary. A longitudinal, interpretive case study adopting Giddens's modernity lens.
Chua, Lim, Soh, & Sia (2012)	*MISQ*	Clan controls can be developed to help govern the program. The team can create clan control through building and mobilizing social capital. An exploratory, longitudinal case study using social capital theory.

Table 3. Relevant Papers Identified by Keyword Search

Currie (2012)	*JIT*	In a large, public program, key stakeholder groups may remain aloof and unconvinced if not involved early in the consultation process. A longitudinal case study employing institutional theory.
Elbanna (2010)	*JSIS*	Effective management requires the manager to mobilize a network of resources well beyond the boundaries of the individual projects in a multi-project environment, which highlights the need for such an environment to include a governance structure as a program or program management office. A case study following actor-network theory.
Poltrock & Handel (2010)	*JMIS*	Discusses various approaches to enhance collaboration in engineering programs. Suggests various ways of collaborating to help govern the program. A grounded theory approach with a coordination theory lens.
Seddon et al. (2010)	*MISQ*	The benefits from an ES implementation stage over long-term and short-term projects. The factors of benefits include conditions of functional fit, organizational inertia, integration, process optimization, improved access to information, and ongoing major ES business improvement projects. Proposes a model based on prior literature and tests its validity using qualitative content analysis.
Vega, Chiasson, & Brown (2008)	*JIT*	While some contextual elements are within the control of program managers, many aspects are outside their control. These external contextual factors—such as evaluation, power, goals, resources, and alienation—prevent public programs from achieving their outcomes fully. A case study using diffusion of innovations lens.
Brennan (2007), Clegg & Shepherd (2007), Currie & Guah (2007), Eason (2007), and Sauer & Willcocks (2007)	*JIT*	Five papers on the case of Britain's program for the National Health Service. Considerations over the five papers in the special issue include a focus on the IT rather than IT enablement; working with users to precisely define and communicate the benefits; dealing with a complex, political institution; and inherent resistance to change. These are issues of context, type, conditions, and governance. Each is a case study.
Cunningham & Finnegan (2004)	*JIT*	Transformation programs change organizational process and structures in significant ways, which results in new information systems management roles and structures to meet the new information requirements. A multiple case study (n = 4).
Markus (2004)	*JIT*	Technology-driven organizational change is a deliberate strategy. IT project management is not sufficient for the implementation and success of such IT-driven change. Instead, a program of change initiatives is needed. Suggestions include a four-stage governance model. An editorial on the state of the art.
Roberts, Cheney, Sweeney, & Hightower (2004)	*JMIS*	Complexity can affect group interaction processes. Defining roles and tasks becomes increasingly difficult. A quantitative experimental study.
McGrath (2002)	*EJIS*	Improved program success was accomplished with a key stakeholder group able to affect development while avoiding unnecessary outside influence. A case study following actor-network theory.
Drummond (1996)	*JIT*	Individual projects in a program can change as a result of changing organizational scenarios. A case study using an escalation lens.
Harkness, Kettinger, & Segars (1996)	*MISQ*	In an organization-wide process improvement program, current improvement projects provide the necessary staging for more complex and higher-impact process activity in the future. A case study.
Kelleher (1995)	*ISJ*	A four-stage program governance methodology derived from a case study.
Willcocks & Smith (1995)	*JSIS*	In programs, project objectives detract from more important determinants of long-term success or failure. Considerations of the processes improved and the power dynamics among the key stakeholders are the most critical. A multiple case study (n = 3).

We identified key concepts from this list of papers. We capitalized on these concepts and generalized them based on works in the program management literature and peripherally related papers in the IT literature. These related papers informed our understanding of programs through specific applications. In particular, papers on the topics of ES and outsourcing often described system implementations and product portfolios that are managed as programs (e.g., Chang, Wang, Jiang, & Klein, 2013; Chang, Jiang, Klein, &

Wang, 2014; Levina & Su, 2008; Parolia, Jiang, Klein, & Sheu, 2011; Su, Levina, & Ross, 2016). Other papers served as predecessors to the topic, especially those that considered new perspectives on IT project management (e.g., Maes, De Haes, & Van Grembergen, 2015; Reich, Sauer, & Wee, 2008; Sauer & Reich, 2009). We combined the key concepts into the descriptive framework of Figure 2.

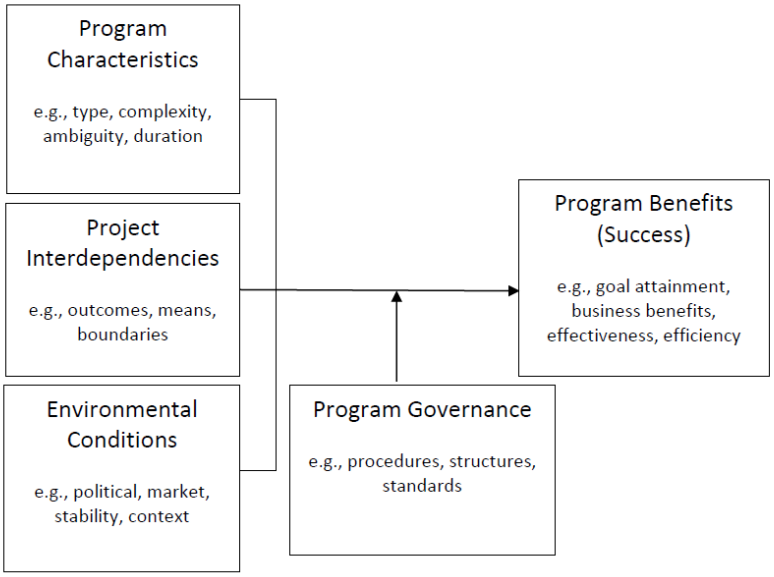

Figure 2. Relationships in a Program

We outline the key concepts as follows:

1. The **program benefits** that IT enablement targets are the determinants of program success (Jiang et al., 2014). The implementation goals often concern effectiveness and efficiency yet also extend to the attainment of larger strategic goals related to the overall organization and the attainment of business benefits though transformation of organizational practices (Carugati et al., 2018; Seddon et al., 2010; Willcocks & Smith, 1995). Having a program perspective in success measures can encourage appropriate actions (Molloy & Stewart, 2012). Following specific goal-setting strategies serves to move the program forward more effectively (Chang et al., 2014). Program goals go beyond specific deliverables to include major changes to the organization. On the whole, program objectives are often wider, fuzzier, more indirect, and more far reaching than those of traditional projects (Artto et al., 2009).
2. A variety of **program characteristics** affect whether the program succeeds. Program characteristics include factors such as complexity (Roberts et al., 2004). Further characteristics may include the type of program (such as public or private sector) (Brennan, 2007), industry (Gregory et al., 2015), application (Chang et al., 2013), and duration (Drummond, 1996). One needs to responding to these conditions when managing roles, processes, and controls (Lycett et al., 2004).
3. **Interdependencies** among projects must be leveraged, managed, and controlled (Elbanna, 2010; Jiang et al., 2014). Interdependencies exist in programs between actors, tasks, resources, and goals. These interdependencies in the management of programs reflect the extensive work in social interdependence theory (Johnson & Johnson, 2005). Interdependence among the projects in a program can add to the difficulties and advantages of resource coordination (Parolia et al., 2011) when working toward a common goal (Chang et al., 2014) and can help practices and technology co-evolve.
4. **Environmental considerations** inform the program management processes established by an organization (Pouloudi et al., 2016; Rose & Schlicter, 2013; Vega et al., 2008). Programs are subject to a greater set of influences due to their increased scope of benefits and longer duration (Drummond, 1996; Eason, 2007; Seddon et al., 2010). Politics play a crucial role both internally and externally (Currie, 2012; Currie & Guah, 2007). Inherent risks create concerns for controls (Drummond, 1996). The stability of technology and the vagaries of the marketplace can dictate

essential changes to how a program may be structured or managed (Markus, 2004). In all these variations, the program structure must be compatible with the structure of the environment (Yu & Kittler, 2012).

5. Programs require **governance** structure to ensure they move effectively toward successful completion (Kelleher, 1995). The differences in the targeted benefits, characteristics, interdependencies, and environment between programs and projects require changes to management approaches. Almost every paper listed above discussed how management may need to consider changes to governance structures, standards, or procedures to control the problematic traits throughout the life of the program in order to attain success (Pouloudi et al., 2016). Governance must account for the implications of given conditions, environments, and interdependencies that exist or emerge in order to maintain the course of benefit attainment (Chua et al., 2012).

4 Organizational Benefits

Organizations adopt program management practices to fill a void. Although traditional projects are an effective structure for delivering well-defined outputs under carefully planned time and cost constraints, they are woefully inadequate to address the dynamic nature of the interaction between the firm and market (Thiry, 2002). Extensive change management in organizations requires flexibility as opposed to strict planning and control mechanisms (Partington, 1996). The flexibility to respond to emerging opportunities and changing situations is negated by an insistence on tight definitions, clear boundaries, and rigid assumptions. Managing change requires a set of tools different from traditional project management. To overcome this problem, program management serves "as a bridge between [an organization's] strategy and projects" (Pellegrinelli & Bowman, 1994, p. 129). Program management tackles the complexities of adjusting to new conditions and allows projects to be simplified. While the program itself continues to adapt to the emerging conditions of the organization, projects are protected from continuous change in objectives and plans. Even though early publications raised the nature of program benefits, more contemporary research has developed the notion that programs are separate entities to a degree where program management is "a new discipline" altogether (Lycett et al., 2004, p. 289) and not just a "scaled up form of project management" (Lycett et al., 2004, p. 294). The management aspects have a clear application to the IT field yet offer new problems as well.

Instead of focusing on producing a specific deliverable, program management focuses on organizational repositioning for strategic purposes, which gives programs a role in the organizational setting to act as a vehicle for change management and for implementing an organization's strategy (Partington, Pellegrinelli, & Young, 2005). When using IT to enable organizational strategy, we enter the domain of organizational change management and organization development. In this domain, an organization views IT projects as a system of interrelated activities that combine to achieve a common goal—a program. The common goal of the program is to move toward the overall strategy of the organization by delivering new capabilities. New capabilities might require transforming the organization, improving the ability to network with other organizations, or significantly improving operations. The organization strategy sits above the program and acts as a key driver in the organization's locus of control.

Further, program management still considers efficiency because programs rely on a common resource pool of technology and people for each project. Program management must provide synergistic benefits through coordinating its multiple projects, which are otherwise unavailable when managing projects independently (Project Management Institute, 2013). One reason for the wide adoption of program structures is that they allow multi-project coordination to provide benefits beyond those available from each project being managed independently (Pellegrinelli, 2011; Young, Young, Jordan, & O'Connor, 2012). Since over 90 percent of project activity occurs in a multi-project environment, programs ensure that complex initiatives and changes unite through coordination of objectives, resources, and interdependencies across the individual projects (Cash, Earl, & Morison, 2008).

Therefore, we identify two benefits as program achievements that organizations cannot readily attain through other organizational structures: 1) a sharper business focus that leads to more coherent communication; improved project definition; and better alignment with business drivers, goals, and strategies; and 2) enhanced efficiency in executing multiple projects through improved coordination, dependency management, resource utilization, knowledge transfer, and intra-organization visibility. These benefits imply different perspectives to determining the success of a program versus a project. While an organization might view IT project success in terms of usage, standards, budget, schedule, or quality, one would view programs in terms of strategic goals, organizational efficiencies, or market position. Thus, in responding to specific organizational needs, programs go beyond implementing an IT solution to present some unique characteristics and issues for studies about their benefits (e.g., "What organizational

benefits do programs commonly target?", "What is the locus of decisions about projects?", "How are projects constructed to provide effective and realizable measures and targets?", and "How should goals be structured to promote success?").

Specific benefits alter the course of the organization and drive the program, which includes what projects one selects for the program. Determining what benefits to pursue also drives what stakeholders to consider, which includes information targets in pursuing requirements, adds to the magnitude of effort, and alters the decision maker landscape of IT management. Users are no longer the primary target for satisfaction because beneficiaries throughout the organization become actors in programs. Benefits are more difficult to measure than a project's time, budget, and scope considerations, and they extend beyond considerations of project success and IT system success models. As an organization pursue benefits, translating benefits to program goals and further to project goals is a critical activity since the collection of goals must provide a single-minded pursuit among the various functional areas, layers of management, and informal interest groups in the organization.

The limited issues in considering organizational benefits and program success that we raise above demonstrate ample opportunity to develop or expand models of decision making, IT success, and goal setting that cross functional, temporal, project, and decision maker layers. Perspectives that may prove useful include multiple level input-process-output (IPO) and input-mediator-output (IMO) models. Certainly, researchers should consider IT success models as a possible launching point. Success or failure is often defined as a deviation from a stated goal, which indicates that variations of expectation-confirmation models warrant consideration. As always, one should be wary: existing theories may be too restrictive in their current boundaries and assumptions and, thus, require one to extend them to include the evolving structure of program management.

5 Program Characteristics

Recall Figure 1, which presents the interfaces encountered in a program. The program must continually evolve to maintain effective alignment with organizational strategies and must respond to the external environment as needed to retain relevance. The projects in a program, at any given time, will likely vary by type; as such, they will require decisions to keep them in alignment. Interdependencies, such as those among goals and resources, have further implications for moving the projects collectively toward program ends. In short, the type of program adds significant complexities to program development and implementation or may serve to alleviate or confound the complexities (e.g., Dawson, Watson, Boudreau, & Pitt, 2016).

We can describe complexities based on their source. There are at least four categories of complexity relevant to programs relevant to IS researchers: 1) structural complexity, 2) technical complexity, 3) directional or organizational complexity, and 4) temporal or dynamic complexity (Xia & Lee, 2005). Each program is likely to exhibit one or more types of complexity. Structural complexity resides in programs with a large number of projects or subprojects. This complexity arises due to an increase in the number of functions involved, particularly in programs that provide the infrastructure for sharing information across an enterprise. Structural complexity derives from the difficulty of managing a large number of different, interconnected projects and peripheral tasks/activities and from requiring significant input from a variety of knowledge areas (Pich, Loch, & Meyer, 2002; Ribbers & Schoo, 2002;; Bernardi et al., 2017).

One finds technical complexity in programs that have technical or design issues associated with previously unproduced products or with techniques that are unknown or untried and for which there are no precedents (Meyer & Curley, 1991), at least in the organization. Here, the complexity stems from the interconnection between multiple, interdependent solution options that must be carefully structured to fit organizational needs and environmental constraints. One can find a similar situation in industrial design, engineering, explorative IT projects, and research and development projects (Baccarini, 1996). The challenges usually involve managing the critical solution design phases, managing contracts to deliver solutions to ill-defined design and technical problems, and managing the expectations of key stakeholders. Rapid changes to technology make programs susceptible to technical complexity. Both structural and technical complexities are likely to affect program-to-project alignment and alignment across projects.

In contrast, disjointed goals and goal paths, indistinct meanings, and hidden agendas characterize directional complexities. These complexities stem from ambiguity related to goals and objectives or from multiple interpretations among the many stakeholders and across organizational levels (McKeen, Guimaraes, & Wetherbe, 1994). A common instance of ambiguity arises when the solution space is smaller than the business problem space in certain projects in the program. The program suffers from a lack of alignment with the organization—perhaps through inadequate identification or expression (Baccarini, 1996). The program manager must contain or even capitalize on these differences and merge the values from the

diverse perspectives of IT experts and those more involved with the business processes.

The final complexities are temporal and characterized by shifting environmental or strategic directions outside the direct control of the program team. Such complexities stem from uncertainty regarding future constraints, expectations of change, and even the benefits of continually pursuing a program (Meyer & Curley, 1991). Programs subjected to unanticipated environmental effects—such as rapid and unexpected legislative changes, business and market changes, or the development of new technologies—can destabilize (McKeen et al., 1994). One can find temporal complexity in apparently straightforward programs, particularly those of long duration. Longer durations can lead to problems in such programs because technology can advance several iterations, and responding to these technological changes over the course of the program becomes critical to success.

The characteristics of complexity can be present in every program regardless of type (Artto et al., 2009). Four program types include: 1) common element programs, 2) performance improvement programs, 3) new development programs, and 4) strategic transformation programs. Common element programs should organize around projects with a common theme (Pellegrinelli, 1997). Such programs have no role in defining their projects; instead, programs are built around contracts or products. For example, IT outsourcing firms will manage contracts for a similar product as a single program even though they treat each client as a separate project (Parolia et al., 2011). Often, the program's goals are simple and seek to gain efficiencies by exploiting common elements, which mostly share resources, knowledge, and technology. Usually, IT dominants such programs or they mostly lack IT altogether.

Performance improvement programs aim to achieve regular improvements to ongoing processes or facilities. In this sense, the improvement may concern gradual process overhaul or capacity enhancement. Ferns (1991) categorizes such programs under the term "business cycle" programs. In the IT context, business cycle programs include software version releases (Pellegrinelli, 1997). Managers develop these business cycle programs in a bottom-up manner whereby they initiate the improvement request for approval from the executive; however, the opposite is also possible. From another perspective, an organization could conduct these programs to improve its IT infrastructure to retain the ability for rapid changes in IT delivery and volume (Gray & Bamford, 1999). In contrast, performance improvement programs may involve only minor IT enablement, such as quality control systems that rely more on active process redefinition.

New development programs appear in different forms throughout the literature. Ferns (1991) considers these programs to be very large projects with a single objective. They are called "programs" simply because of their size, their importance, and the fact that they use projects as a means to separate duties or decompose the overall deliverable into manageable chunks. Examples include the Channel Tunnel, aircraft, large IT systems, and space satellite development. This program's intent to deliver a specific product that requires many inputs that are themselves precise deliverables of projects earlier in the program typically distinguishes this program type from others. Often, a new development program has direct, commercial value as one would expect from major construction contracts or large-scale, single-purpose information systems. This concept indicates that organizations create programs to efficiently manage multiple projects. Difficulties increase as the number of projects increases. The difficulties of incorporating IT into systems with minimal IT components or dealing with extensive legacy systems exemplify situations that may drive decisions about how to manage programs.

Programs for strategic transformation are goal directed (Pellegrinelli, 1997). These programs occur beyond "business as usual", and organizations use them to turn their business strategies into reality or to completely transform their cultures, product lines, or process maturity levels. In launching such a program, an organization addresses the need to adapt to shifting strategic goals while nurturing organizational capabilities and pursuing efficient deployment of resources (Partington et al., 2005). A new service development with ambiguities, a lack of information, and guidance only from an evolving implementation process exemplifies such a program. In the IT domain, examples include ES that re-engineer the processes in an organization and programs designed to achieve competitiveness (Gregory et al., 2015). Such programs are typically multidisciplinary and focus on defining projects that address the needs of new business objectives (Ferns, 1991). Difficulties increase with the degree of change required. It is likely that IT support or even an IT element to the change is essential to the overall program with its associated problems and requirements to determine the best roles, structures, and processes to govern the program.

Research questions on program characteristics could focus directly on complexity and associated models (e.g., "Does the nature of the complexities introduced matter in attaining success?"). One can break down related issues into questions about duration, planning horizons, vague specifications, identifiable risks, and uncertainty (e.g., "Are there effective counter-agents or counteractions to the various complexities?", "Are the described complexities at this level mutually exclusive in their influence or exhaustive in their

enumeration?", and "Which factors contribute the most variation in each complexity?"). Although this discussion centers primarily on complexity, other perspectives (such as the type of program) might be more appropriate to consider among the characteristics, including how these characteristics influence the attainment of planned benefits. Empirical consideration could address complexities in relation to success. Researchers need to pursue investigatory approaches to consider building a more thorough picture of the characteristics that tend to create problems for management and attainment of success. Project complexity theories provide a solid foundation for understanding certain behaviors because of the intensive relationships among projects over resources and objectives (Bakhshi, Ireland, & Gorod, 2016); however, many such theories have their roots in the culture and structure of an organization and the interactions among project teams. Thus, social identity or theories related more directly to the traits considered in specific research questions may be of interest.

6 Interdependencies

While complexities arise from the nature of the problems and goals, interdependencies result from the relationships created by employing multiple groups in an organization, such as project teams in a program. It is at the program level that projects are created, directed, controlled, modified, and closed. Many programs will be IT specific while others will not. Although a program strives to isolate a project to create an environment that promotes success, many interdependent features create both problems and opportunities for program management; that is, they can be a negative or positive feature depending on how one constructs and manages the program. Although researchers consider interdependencies to be artifacts of personal relationships in a social group, research in management and other fields has shown them to be applicable to multiple levels, including at the program level in IT implementations (Chang et al., 2014; Parolia et al., 2011). These interdependencies fall into three primary categories: 1) outcome, 2) means, and 3) boundary interdependencies.

Outcome interdependencies primarily consider goals and rewards. Consider a project manager and team members: they best manage a project for success when they appropriately define the goals associated with performance (e.g., in regards to the dimensions of budget, schedule, and product) (Thomas & Fernandez, 2008). The project associates rewards with compliance to these three performance dimensions. In this manner, taken to the extreme, the team manager and team members establish a project to be an independent entity. The project manager and team strive to deliver their product without considering other projects, teams, or managers. In this case, each project in the program has a different set of goals that may conflict with those of other projects. In a static environment with fully dedicated resources, this approach may be effective. The other extreme is to place greater bonds between projects where project goals are fully subservient to those of the program and rewards are based on effectiveness and long-term achievements. However, in this case, reduced attention to individual project success may compromise whether the program succeeds because each project influences whether the program completes successfully. Early work shows that, with shared goals, a lower number of goals may be most appropriate; however, the evidence is scarce and limited by program type (Chang et al., 2014).

Means interdependency represents the required sharing of common resources, the overlap of tasks, the distribution of cross-functional knowledge, and the assignment of roles across projects in a program. These activities indicate many issues associated with assigning personnel to the projects in a program. Effectively managing a program requires knowledge be available and shared across projects. Expertise will often be scattered across the projects in a program, yet knowledge requirements require wide dissemination. Essential knowledge sharing requires effective forms of communication and coordination among projects that should be structured by program management. Other personnel issues arise due to the assignment of talent to multiple projects. Duplicate roles and responsibilities might require one to consolidate certain project functions. Controlling role interdependence is an issue in programs in which external agents participate in driving the program toward success (Chang et al., 2013).

Program management must also ensure the organization distributes and redistributes physical resources for overall progress with minimal disruption to individual projects. Decisions about IT platforms—including commercially acquired products, such as enterprise software—affect decisions about technology in other projects and, thereby, increase resource interdependencies. Again, the variety of means interdependencies may have both positive and negative effects. Research has shown resource interdependence to improve coordination among projects in a common element program (Parolia et al., 2011). A project often needs to complete its deliverables or tasks for a successive stage in yet another project to begin. Slippages in schedules, changes in priorities, and alterations in organizational requirements often disrupt preordained resource assignments. For many years, quantitative models focused on such issues; however, we could find little about the social aspects of actions taken (Hartman & Briskorn, 2010). We still do not understand the way to construct and manage means interdependence to be a positive influence in a program.

Boundary interdependence includes aspects of personal relations in a group and group identification by individuals. Much research has studied the effect of personal relations in a group but not across project and program boundaries. Projects all compete for management attention and often detract from the overall support required to achieve program goals (Elbanna, 2013). Adding cross-functional membership, directional complexity, and the dynamic environment that encapsulates programs to issues of identification raises a substantial number of questions that must be resolved. Moving interdependencies into the positive side from the negative side has tremendous potential if lessons translate to the program level from the individual and social levels of prior studies. Positive interdependence promotes productivity and achievement, tends to be additive, facilitates insight and reasoning, and consumes fewer common resources, which leaves more for others to share (Johnson & Johnson, 2005).

Identifying interdependencies has the potential to drastically improve programs, and understanding interdependencies will help align different projects with one another and projects with programs. Projects in a program do not stand alone and must share goals, resources, activities, and relationships. To best move a program forward, how can interdependencies among projects be leveraged to improve coordination and collaboration, promote knowledge sharing, achieve effective communication, assign priorities, and promote dedication to program goals so that project requirements are also attained? Which interdependencies create the most difficulties or provide the most benefit? Do interdependencies differently affect the program and individual projects? A project is subservient to a program and has secondary goals compared to those of the IT program; however, goal interdependence may create a common bond among projects in a program, while resource interdependencies may create conflict. A better understanding of the nature of these links among projects may allow organizations to create better program practices.

7 Environmental Considerations

Every program is unique to its contextual environment. Program context includes both internal and external organizational considerations of culture, politics, market forces, and application context. Considerations include the stability of the environment, harmony or fit across the structure and organizational levels, and adaptability of the program. In this section, we explicitly consider some environmental considerations, although the possibilities for research are much broader than we can present.

One internal consideration must be politics (e.g., Müller, Mathiassen, Saunders, & Kræmmergaard, 2017). Program management and project management differ by their need to manage political power dynamics and different levels of relationships. Program management requires high levels of communication, involvement, support, and reconciliation across the organization to ensure relevant stakeholders continue to understand changing priorities, shifting strategic focus, and new opportunities and restrictions so that the program can be adapted accordingly (Pellegrinelli, 2011). The environment is particularly volatile in technology areas, which may result in significant modifications at the project level, such as the addition or forsaking of certain deliverables, abandoning a project altogether, or beginning a new project. Franken, Edwards, and Lambert (2009) stress the high levels of behavioral and power aspects of strategic change programs. Lycett et al. (2004) equate program management with relationship management. They identify three types of relationships that a program needs to manage: 1) the relationship between the program and each constituent project, 2) the project-to-project relationship in a program, and 3) the important relationship of each project to the business strategy and objectives. They assert that power dynamics in organizations influence program management much more than they influence projects because of their longevity and changing business needs. Therefore, a program needs to engage with the individuals who hold power in the organization. Given the frequency with which new technology makes social and relationship change necessary, programs have the potential to aggravate any problems.

A grasp of the current and future external environment will influence the direction a program takes. Any changes in the market or technologies will create opportunities that the organization will wish to pursue. When directions shift in an organization, programs must also shift. Further, programs must shift with external changes, even if the organization does not make a correction to strategic policy. Any changes identified may require alterations to the program's scope, defined benefits, or priorities. The program's goals must adjust to provide direction for an aligned decision framework (Scherpereel, 2006). In this manner, unpredictable environmental factors require managing programs through a flexible and adaptable structure. Program management must change through top-down directives due to organizational responses to the external environment and evolving organizational traits yet also incorporate emerging decisions from the bottom up through successfully monitoring the context.

The context of internal and external environmental factors creates a high level of uncertainty. Increasing uncertainty increases the threat of failure. A program with less structure and less certainty yields greater interdependence among projects and greater interface

to the internal and external environment (Verma & Sinha, 2002). Any increased uncertainty owing to the environment adds stress to the strategic direction of the organization, project delivery, program implementation, program goals, and alignment among these elements. As such, stability is an attractive feature but not a common occurrence over time. Organizations must identify and address any instability. Similar considerations apply to issues of harmony and other contextual factors of the environment.

An organization's internal environment imposes conditions through existing culture, standards, and politics. As an organization offers new products, its culture or structure changes. As it expands into new parts of the world, internal contradictions rise to alter chances of program success. The dynamic nature of the external business climate and the progress of technology limit an organization's ability to make isolated decisions and make focused action problematic. Achieving a program's broad benefits requires paying greater attention to environmental conditions than with a project, which feature more defined deliverables. How do these dynamics play a role in achieving program success? One primary reason why organizations conduct a program of multiple projects is to launch initiatives in controllable stages, alter the course of an ongoing program by selecting projects not initially considered viable or appropriate, or terminate projects that fail to provide deliverables appropriate to the new environmental conditions. Thus, the volatility of the environment is very influential. What entities, industries, or markets need continual scanning to recognize changed conditions? What risks are present that can derail even the best-planned program?

8 Governance

Separating governance as its own topic can be problematic because this topic overlaps with much of the discussion above. Governance represents the management and control of the program from its conception through to its eventual close. Governance is performed through a structure internal to the organization and includes the organization's formal procedures, processes, policies, roles, and value systems. The governance system regulates control and influences trust. Further, governance is practiced at all levels of an organization, which includes programs and projects, and every level of a hierarchy or network node. The governance structure must set goals, provide the means to achieve these goals, and control the progress of subordinate hierarchical level or adjacent nodes in management. Thus, programs have a governance structure; however, it is subordinate to the comprehensive governance structure that encompasses all work in an organization. As such, the governance of the organization as a whole affects the governance structure of a program, which subsequently affects the governance structure of projects. The best governance structure for a program must be compatible with that of the organization.

For each program, one consideration must be the complexity encountered. Different forms and levels of complexity likely require different governance structures. Researchers have commonly associated structural complexity with IT development programs. Turner and Speiser (1992) assert that around 90 percent of projects are not executed independently but are in a multi-project environment. Such an overwhelming number allows a great opportunity to extract more synergic benefits from these projects by aligning them with each other and with their program. To manage these programs, organizations decompose outcomes into many small deliverables and manage them as discrete units. They do so based on the assumption that, when delivered, the individual units/projects will come together to create the required whole. The major challenges arise from program organization, scheduling, interdependencies, and contract management. While we can easily recognize this last challenge, we lack sound advice on how to best divide a program into interdependent projects. In all cases, one needs to design the interdependencies among projects to be positive contributors.

In contrast, disjointed goals and goal paths, unclear meanings, and hidden agendas characterize directional complexities. These complexities stem from ambiguity related to goals and objectives or from multiple interpretations among the many stakeholders. One finds these complexities when an organization implements an enterprise resource planning system: each department that receives a module will have a unique set of demands and expectations. The governance challenges tend to be associated with the allocation of adequate time during program definition (program initiation) to enable stakeholders to share meaning and reveal hidden agendas. The program tasks and resources must focus on benefitting the whole. Controlling relationships and organizational politics often become critical to success. The tools employed in the control task may not be appropriate when translated from the project to program level because issues that arise in one project may have disparate implications to other projects in the program.

In temporally complex programs, the program team must be ready for the chance to implement one of the developed options and not wait for the time when everything becomes stable. It is easy to become locked into early ideas, which is something that was appropriate in the past but is no longer viable. Thus, it is important to ensure that team members do not develop ego attachment to a particular program outcome or direction. Having program team members work in multiple facets of the program helps reduce

this possibility. Traps and consequences due to temporal complexity escalate as the size and duration of the programs increase. This escalation arises due to the number of key program stakeholders and the program's lengthy duration, which have increasing the propensity to trigger risks.

Of significant concern among many organizations is whether governance standards provide achievable benefits. Professional groups promote standards for governance, consultants provide roadmaps for consistency, and vendors provide software to help standardize the governance process. Some standards that advise governance include the Project and Program Management for Enterprise Innovation, the Project Management Institute's Standards for Programs and Certification for Program Managers, and Managing Successful Programmes. Research has not established whether these or any other guidelines provide the essential element of control. The collective wisdom of many professionals is important and can be fruitful to consider. The issue concerns the actual attainment of success and contingencies for application and execution. Other standards exist in trade publications regarding building an organization program office. However, the specific duties and structure of a program office remain ill defined. Other aspects of program governance include issues of leadership traits, the composition of program boards, and the assignment of responsibility at all levels of management.

Further, organizations must determine which capabilities they need to maintain for effective governance structures. For example, ambidexterity as a capability in the governance structure adds to the ability to respond to seeming paradoxes among stakeholder requirements and expectations (Gregory et al., 2015). Integrative conflict management is a capability that promotes a common direction to pursue tasks and a commitment to a program's goals (Jiang et al., 2014). Governance must manage knowledge for programs, build communication and coordination structures, and design control systems. Investigating the required or substitutable capabilities for programs is an essential task for researchers with interest in the success of organizational IT efforts.

The structure of management and internal processes is critical to promoting the success of programs. An organization may determine the structure in light of architectural collaboration models (Fjeldstad, Snow, Miles, & Lettl, 2012). Some of the governance issues include: "What are the effective delineations among IT projects, programs, and portfolios?", "Does project and program maturity play a role in achieving objectives?", "What elements of control provide effective program stability and direct attainment of goals?", and "What is the role of IT managers in program attainment, and what is their relationship to members of the C-suite, program board or program office, and management in other affected functions?". Research has not vetted the professional standards for project and program management. However, the focal issue concerns determining the structures, controls, procedures, tools, and advice on how to achieve success and what contingencies one should make to those practices in light of the variety of differences in a program's characteristics, its interdependencies, and its changing environment.

9 Conclusions

As may have become evident throughout the discussion, the study of programs has much to reveal to the many organizations that thrive or survive on change. In this paper, we discuss only the tip of the iceberg. As with all research, continued investigation into programs will reveal more questions than answers; however, we present the information in this paper as an invitation to meaningful future work. To pull it all together, we present five major categories that we believe relate to one another (see Figure 1). The predictors of a successful program will include, at the very least: 1) considerations of program traits, 2) interdependencies of the projects in a program, and 3) the changing conditions of the environment—both internal and external. A firm's ability to effectively govern the program will determine the precise nature of the relationship. Table 4 summarizes the potential research questions that we raise in this paper along with potentially relevant theoretical lenses. We do not intend these suggestions to limit future research but to present initial approaches to move this area forward. We need to extend or build theories and, in some cases, define and develop constructs. There is certainly room to employ all approaches to studies whether qualitative, quantitative, or mixed methods.

Table 4. Potential Research Questions

	Research questions	Potential models and theories
Benefits/success	What organizational benefits are commonly targeted by programs? What is the locus of decisions about projects? How are benefits selected and communicated to provide effective, realizable measures and targets? How should goals be structured to promote success?	IPO/IMO models IT success models Expectation-confirmation theory

Table 4. Potential Research Questions

Characteristics	Does the nature of complexity matter in attaining success? Are there effective counteragents to the various complexities? Are the described complexities at this level mutually exclusive in their influence or exhaustive in their enumeration? Which external and internal factors contribute the most variation to each complexity? Similar questions arise for all major characteristics.	Social identity theory (selection must be related to the characteristic variable of choice)
Interdependence	To best move a program forward, how can interdependencies among projects be leveraged to improve coordination, achieve effective communication, assign priorities, and promote dedication to the program goals, so that project requirements are attained? Which interdependencies create the most difficulties or provide the most benefit? Do interdependencies differently affect the program and individual projects? What challenges arise in managing the IT personnel when IT staff are allocated as resources across multiple projects in a program?	Social interdependence theory Social exchange theory Power models
External environment	How does external dynamics play a role in achieving program success? What in the external environment must be continually scanned to recognize changed conditions? What risks are present that can derail even the best-planned program?	Legitimacy theory Stakeholder theory (must relate to the environmental variable of study)
Governance	What are the effective delineations among IT projects, programs, and portfolios? Does program maturity play a role in achieving objectives? What elements of control provide effective program stability and direct attainment of goals? What is the role of IT managers in program attainment, and what is their relationship to members of the C-suite, program board or program office, and management in other affected functions? What new roles are necessary for programs beyond those common to practice? How must managers be prepared and trained?	Control theories (e.g., affect, feedback, social) Contract theories (e.g., psychological, social) Collaboration theories Social networking theories Collaboration architectures

Many of the issues that need to be investigated also contribute to the difficulty involved with a study. Temporary organizations provide timeframes for data capture, even in stages over a lengthier period. The dependency of processes in programs means that one must undertake generalization carefully and be sensitive to case selection and sampling logic for data and the specification of boundary conditions for the theory developed. Some organizations have a clear separation of projects, programs, and the permanent organization, which would require one to carefully consider units of analysis and level-crossing in a study (Bélanger, Cefaratti, Carte, & Markham, 2104). Qualitative approaches may take longer to converge or may need critical reflection to determine which part of the knowledge derived from the study is actually transferable to which circumstances. Quantitative approaches must be carefully designed to consider the multiple levels of management represented and to attain multiple sources as key informants for each of the central variables in a study. One can present perspectives on the phenomena from the IT, project management, or general management standpoints.

Regardless of the research approach, programs are fruitful areas for improving organizations that provide substantial opportunity for investigation. Our introduction to the topic and issues is merely a first step to highlight the many areas that require study to enhance understandings of the inherent complexities. Work by professional societies, management researchers, and IT researchers led to the characteristics and topics of this discussion. Programs are a legitimate study target for IT researchers since technology is interwoven with many organization initiatives and IT management is often responsible for program planning, implementing, and deploying. Programs are an alternative perspective for integrating change requirements, management practices, information technology requirements, cross-functional teams, system complexities, environmental drivers, and project management to achieve higher-level benefit targets. IT is often critical though just one

element involved in achieving organizational goals, and a focus on IT components in isolation disregards other essential functions, activities, and conditions in this context.

Acknowledgements

We express our gratitude to the reviewers, including Amany Elbanna, Ning Su, Line Dube, and Suprateek Sarkar, whose suggestions added substantially to the quality of this editorial. This work was partially supported by the Taiwan Ministry of Science and Technology Grant #102-2410-H-002-227-MY3 and the Australian Research Council Discovery Grant #DP130100332.

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