

Redefining Project Management Information Systems with New IT Services

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Abstract: Achieving successful adoption of an innovative project management information system should involve influencing the project management environment by providing useful tools, training, reusable templates, techniques, and methods that improve the project manager's ability to successfully execute. This paper suggests that project management practice, enabled by emerging IT, could more explicitly recognize, represent, and manage the interdependencies that are pervasive throughout projects, thereby fully exploiting the potential of the IT to improve overall project performance. The last few years IT&C evolution led to new approaches to application and infrastructure architecture. Breaking from the traditional procedures used by organizations, they propose a cloud operating platform that reduces complexity and improves agility and scalability by altering the approach to the way data centres are built, applications are developed, infrastructure is managed, and organizations align and collaborate. Further, the paper explores the growing impact of mobile computing, cloud delivery and social business collaboration project management information systems and proposes a shift of a Five C's for information systems in a cloud based operating platform, driven by cooperation, teamwork and continuous improvement. The proposed shift in the cloud indicates actual tools that may be adopted for better collaboration and higher business value of the project information management.

Keywords: project management; information systems; cloud computing

JEL Classification: O32; O33

1. Introduction

In organizations or at home, computers have revolutionised the way documents are generated and managed when data turned to the digital form. Likewise, information technology and communication (ITC) is bound to transform the way people exchange information and documents (Airinei, et al., 2006). Basically, ITC is defined as "the use of electronic machines and programs for the processing, storage, transfer and presentation of information" (O'Brien, 2004). ITC encompasses many technologies such as computers or electronic devices of all types, many sorts of software, and networks. The purpose of ITC is to facilitate the

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exchange and management of information and has a lot of potentials for the information process component of the project management domain. Information technology is driving fundamental changes in our society, from how tasks are done to our expectations for the timeliness and accuracy of their completion (Baldauf and Stair, 2008). It also offers an element of self-perpetuation – one technology creates a need for another to fill. The pace and scope of technological change has prompted a profound change in the way organizations manage their projects. The leading companies become those that can harness the power of the Internet and other technologies to manage their business more efficiently, to effectively address governance compliance and manage risk and how the stakeholders interact (Nagy, 2010).

The shift in focus from work being performed by operations to work being performed through projects requires that an organization establish standard project management practices, including best practices, consistent processes, standards, guidelines, tools, and templates. To ensure consistency of execution and reporting, the organization must also provide appropriate project management training and a data repository for the timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information. This can be achieved through the implementation of a well-organized and constantly developed information system, based on a reliable information management.

Most of the key project management solutions' vendors are mature and well positioned as a result of the many years of experience. Main players like Primavera, NIKU, PlanView, and others have a market stronghold in managing projects of all sizes and scope. That being said, comparatively newer, up-and-coming organizations should be recognized not only as visionary for their real time capabilities, but for developing and offering solutions based on technology trends and new IT services. Solutions built in this scope have the capability of managing project portfolios, programs, projects and resources with necessary diligence; managing IT and corporate governance; providing enhanced processes, tools, and best practices methodology support; improving project team collaboration; and supporting and measuring progress toward project initiative objectives (Crosby, 2012).

2. The Information and Communication Technology in a Digital World

Digital, *communication*, and *technology* are three very simple words when defined separately. Digital is data, information, images, or media represented by a series of bits in 1s or 0s that can be sent via digital networks (Malecki and Moriset, 2007). Communication is an exchange of verbal or nonverbal interaction between two or more individuals (or machines), whereby the input may or may not have an effective output. Human communication (face to face or electronically) involves

interpersonal messages delivered either verbally or nonverbally through speech, body language, written English, or symbolic messages. Machine communication can be the same exchange or can simply be programming communication via a digital mode. Finally, in simple terms, technology can be defined as all the hardware and software that make up a computer system, a network, and others likewise.

When the three terms are combined, the phrase now becomes an intricate, all-inclusive, and sometimes complicated blend of characteristics that takes on new meaning and includes not only the entire realm of technology (hardware and software), but also the people or organization responsible for the design and use of the technology. To understand the phenomenon of organizational adoption of new IT technologies, organizations must understand that they do more than adopting new automated processes, they are adopting an information system. Figure 1 represents this system, along with the human element controlling it.

In project management, digital communication technologies, such as the model presented in Figure 1, may represent the ability to automate or process data faster, but they also produce challenges for organizations. These challenges include things such as producing an overwhelming amount of data and information, changing business conditions, acceptance of new technologies, meeting training needs, managing data production, finding qualified IT professionals, and ultimately meshing together process control strategies with business plan objectives. This is where the information system may help.

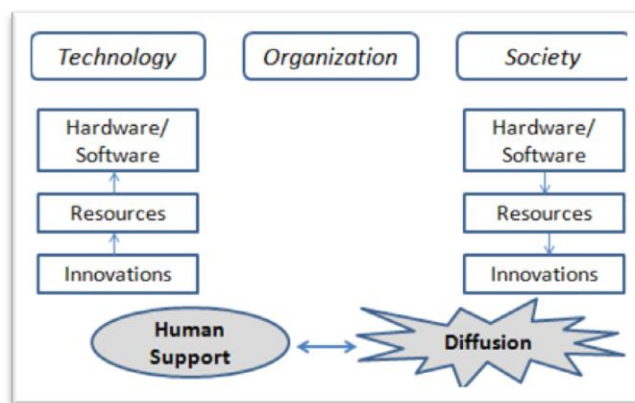


Figure 1. Digital communication technology framework

IT complies with the long-standing saying “nothing is more constant than change”. We assist to an avalanche of new technologies. The role of IT teams has changed from defining the business and building transactional systems, to driving innovation to the point of engagement with customers, partners, and suppliers (Kehal & Singh, 2005; Williams & Sawyer, 2004). IT departments are now

charged with developing innovative solutions that improve engagement and information sharing, ultimately creating new value and efficiency in these relationships. Projects are focused beyond the four walls of the enterprise, ensuring that companies bring information to bear at the moment it's needed. IT is seeking ways to manage an extended information architecture, which allows all employees access to crucial information in real time, and where it can have the biggest impact (Schwalbe, 2010). An IDC survey (2011) indicated that 48% of IT professionals believe that faster access to information (i.e., faster query response times) would have the most positive impact on their organization and project.

3. Project Management Information Systems Challenges

Project Management Information Systems (PMIS) are software applications that help managers track projects from their conception to their execution (Braglia, Frosolini, 2013). They provide them with pertinent information and collaborative tools. Currently, most businesses use disconnected instruments which are not designed for managing complex projects. Increases in complexity, both due to the extent of scope and the fact that the users who contribute to the decision making process are physically separated, have led to initiatives that deal with cooperation, teamwork and continuous improvement (Marchewka, 2012).

Practically, a project management information system consists of a collection of solutions for engineering document management, document control, and project collaboration. It is based on a collaboration platform, providing an integrated suite of server capabilities for developing all the web-based applications required by a firm, like Intranet, Internet, and Extranet, and a central repository for shared workspaces and documents.

The project management interface of the application allows tasks lists to be generated for any user, with automated email notifications to inform team members of tasks. Anyone linked to the project can view and post information and see the lists of open and closed items, enabling transparency and better accountability. In addition to tasks assigned collectively, individual users can create their own to-do lists in the system which can be viewed only by them. The project administrator can set up deadlines and milestones with a Gantt chart to help keep the team up-to-date and on schedule.

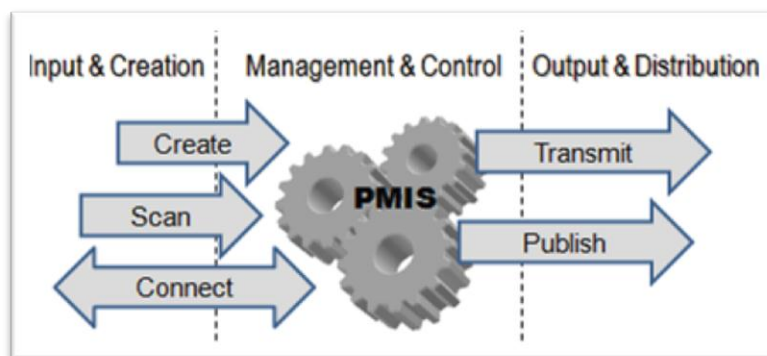


Figure 2. The Project Management Information System functions

A PMIS comprises several different applications that work together to support the basic operations, as shown in Figure 2. The central application provides all the fundamental document management functionality to create, store, search, retrieve, view, check in, check out, edit and revise documents.

No matter what software it uses, the project management information system is aimed towards better information sharing, better accountability, more transparency, less redundancy, and less duplication of content (Yang, 2013).

4. Project Management Information Systems Redefinition. The 5 C's Model

Current trends in information and communication technology (ICT) are yielding a wide range of new computer-based tools to support the project management area. The report "Predictions: Welcome to the New Mainstream" (IDC, 2010) states that in the near-term, we expect to see transformative technologies make the critical transition from early adopter status to early mainstream adoption. We'll see the IT industry revolving around the build-out and adoption of this next dominant platform, characterized by mobility, cloud-based application and service delivery, and value-generating overlays of social business and pervasive analytics. This prediction is based on unarguable demographic data: 269.6 million mobile devices shipped in 2010 – a 55% increase over 2009 (IDC Report, 2010). A Gartner report estimates mobile phones will overtake PCs as the most common web access device worldwide by 2014. While users are going mobile, business IT is taking to the cloud, opting for subscription-based IT services. In fact, by 2014, 20% of businesses will own no IT assets at all (Gartner Report, 2010). Social software, with its familiar interfaces and intuitive functions, has already supplanted e-mail as the communication and collaboration method of choice for the rising generation of corporate workers. According to a Gartner survey, almost half of respondents

indicated they use social software more than e-mail. We conclude that the following four key technologies are enabling a new breed of information systems:

- cloud computing;
- mobile computing;
- social computing;
- big data.

These technologies have allowed market leaders to extend the reach and accelerate the cycle time of their information systems. Cloud services are providing massively scalable computing, ubiquitous access to data and closer proximity to customers. Mobile solutions have created exciting new services for field workers and customer service alike. Social business capabilities enable collaboration and deliver a connected enterprise, customer communities, and market feedback. Big data and the use of analytics are delivering a greater value for today's business leaders. Analytics are essential to improving every aspect of business performance, from strategy to operational excellence, and creating agility.

Cloud computing is considered the next great wave in IT and is currently the major buzzword, so we will further refer to this topic. Practically, cloud computing means using the Web server facilities of a third party provider on the Internet (the "cloud") to store, deploy and run applications. Cloud computing takes two forms. It may refer to "utility" computing in which only the hardware and software infrastructure (operating system, databases, etc.) are offered, or it may refer to "software as a service" (SaaS), which includes the software applications as well. Regardless whether the cloud is infrastructure only or includes applications, major features are self service, scalability and speed. Self service stands for users doing everything online, on their own: they sign on to the service and run their applications as desired. Scalability and speed indicate that the cloud provides virtually unlimited computing capacity and supports extra workloads on demand.

The biggest reason for using cloud services is to reduce costs, followed by speed to adoption and process transformation. Consequently, providers feel their top challenge is to demonstrate clear evidence of cost savings, along with the development of usage-driven pricing and the creation of a realistic business case for the switch to cloud. On the other hand, loss of control is the organizations' biggest concern, with additional worries over data security and the integration of cloud with existing architecture. Organizations are most likely to consider using cloud when they face major technology upgrades, or alternatively, when they're undergoing some form of business transformation.

Cloud computing can provide a fast path to IS redefinition, and there are three major opportunities for cloud computing to accelerate IS renewal:

1. Finding and validating new business opportunities.
2. Improving existing business capabilities.
3. Transforming how IT capabilities are managed and deployed.

The third listed opportunity is significant in relation to the project management information system due to following reasons:

- Traditionally, organizations are typically quite lacking in their own use of IT – managing project tasks via Excel spreadsheets, email and a lot of meetings.
- As specialists estimate, moving to the cloud is inevitable – at this moment organizations have the opportunity to lead the shift and get ahead, at least in terms of learning and experience.
- The nature of IT work in project management, with its complexity and knowledge intensiveness, justifies a more collaborative and networked approach, which might be accomplish on a cloud-based platform.

Based on the new characteristics of PMIS, organizations can leverage cloud computing in their efforts of IS redefinition. The characteristics of complex systems (Cilliers, 1998) offer some important insights into this subject. Accordingly, organization is a natural, spontaneous act and that emergent structure dislikes imposed hierarchy and control. It reveals that creativity arises from variety and randomness. It highlights the importance of relationships, porous boundaries, and free flows of information and self-reference.

These complex system characteristics lend themselves to the use of collaborative approaches to managing information systems (Chiocchio et al., 2012). In the notorious convention of the “Five C’s”, the following components – types of management activities – may constitute a model for deploying the PMIS:

1. Collaborating;
2. Coordinating;
3. Connecting;
4. Co-creating;
5. Coalescing.

Because each of these activities is increasingly being conducted across time and space and across organizational boundaries, enabling them through flexible, scalable cloud solutions becomes an attractive proposition. Practical solutions for enabling the “Five C’s” in the cloud are detailed subsequently in Table 1.

Table 1. A cloud computing based Five C’s project management IS model

<p>C O L L A B O R A T I O N G</p>	<p>Much project work is performed through teams – increasingly distributed across geographies, organizations and time zones. This change forces a shift in work management from a document-centric (write-attach-email-review-attach-email, repeated) to a more collaborative Wiki-based approach, with noteworthy advantages:</p> <ul style="list-style-type: none"> • Wiki’s are naturally non-linear and encourage a ‘constructive informality’ that improves quality over time, drives organizational clarity and reduces redundancy and contradictions. • Wiki’s encourage multi-author collaboration. Whereas the typical document-centric approach has one or two main authors with everyone else in a review role, Wiki’s encourage a collaborative approach to authoring – with higher engagement and understanding in the content. • A Wiki approach simplifies search and discovery. The ability to hyperlink, tag, and use a well-factored semantic Wiki leads to content that is far more accessible, intelligible and searchable for all stakeholders. <p>There are many good Wiki products available as SaaS, including SharePoint, Confluence, and MediaWiki.</p>
<p>C O O R D I N A T I O N G</p>	<p>As project work becomes more distributed, the need to coordinate activities in time and space becomes both increasingly important and challenging. SaaS offerings are ideally suited to helping distributed teams coordinate their activities, including:</p> <ul style="list-style-type: none"> • Real-time communication and collaboration (Instant Messaging, Google Wave) • Collaborative Project Management (Bamboo, BaseCamp) • Desktop videoconferencing (Go To Meeting, WebEx)
<p>C O N N E C T I O N G</p>	<p>In project management, the need to identify and connect people and ideas is important to innovation and learning. As work becomes more distributed, cloud-based SaaS solutions become effective ways of connecting people and ideas, through tools such as:</p> <ul style="list-style-type: none"> • Social Networking (FaceBook, LinkedIn, Plaxo) • Mind Mapping (MindMeister, WebBrain, Bubbl.us) • Virtual Electronic Whiteboards (FlockDraw, Colabopad) • Social Network Analysis (9Netminer, InFlow)
<p>C O C R E A T I O N</p>	<p>As business and IT converge, opportunities emerge to co-create experiences within a project team. New types of SaaS solutions for co-creation include:</p> <ul style="list-style-type: none"> • Modeling and Simulation (Creately, FlexSim, Second Life)

T I N G	<ul style="list-style-type: none"> • Prototyping (iRise, Dreamweaver) • Virtual Worlds (Second Life)
C O A L L E S C I N G	<p>With the increasing distribution of project work comes the need to poll stakeholders, tap into sentiment, come together around ideas and reach consensus around decisions. New approaches and supporting tools emerge into this space, including:</p> <ul style="list-style-type: none"> • Polling (Survey Monkey, Kluster, IdeaScale) • Group Decision Making (Resolve) • Prediction Markets (NewsFutures)

(The recommended applications were included in an IT management case study on the blog of Vaughan Merlyn, a management consultant - <http://vaughanmerlyn.com>)

5. Conclusions

The Information Technology landscape is at the dawn of a radical change in response to a new set of business realities. The nature of work (how and where it gets done), the expectations of a new generation of workers (accustomed to an “always-on/always connected” electronic lifestyle), and emerging business models that challenge traditional concepts of IT cost and time-to-value are driving the change. In response, mobile computing, cloud and Software-as-a-Service (SaaS) delivery and social business collaboration technologies are rapidly gaining momentum in organizations’ information systems.

We identified mobile computing, cloud and SaaS delivery and social technologies to be on the rise in project management information systems. A new way of managing activities emerged – across organizational boundaries, across geographies and across cultures and cloud computing is leading technology. The 5 C’s model of PMIS was defined based on the major activities that are involved and then it was rearranged in the cloud computing frame. IDC predicts global spending on public cloud services alone will approach US\$100 billion in 2016 (IDC, 2012), therefore marrying these activities to the cloud computing based technologies extends their value for growth and innovation. The challenge for IS managers is to combine the power of mobile, cloud and social in a reliable, cost-effective, secure, and user-friendly information system.

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