Object-Oriented in Organization Management:
Organic Organization

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Abstract
In a time when virtual organizations are fast becoming a phenomenon, this paper aims to explore how IT-based approaches—and in specific the object-oriented (organic) approach—can be used to structure and facilitate the management of such virtual organizations. As with traditional organizations, a virtual organization needs a structure that is fast, reliable, adaptable and deterministic. In addition, such organizations need a time and cost-efficient structure to allocate resources and maximize their utilization in a way that avoids deadlock and priority inversion. This paper sets out to present how the organic approach can meet the virtual organization’s needs; it will also illustrate how this approach can be applied to the technology sector of Egypt’s Ministry of Transport.

Keywords: Organization Structure, Object-Oriented, Organic Organization.

1. Introduction
Management is the set of tasks or activities that govern, design and maintain the environment in which employees work together while competing at the same time for the organization’s resources to accomplish a set of jobs or tasks effectively and efficiently. As such, structuring the organization is a fundamental management task.

With the modern virtual organizations as with the traditional large-sized organizations setting the structure has become an extremely complicated procedure. Some organization use classical structuring models, such as the hierarchical organization model (functional, divisional, geographical), the matrix organization or the flat organization, to tackle this issue. However, these models have proved to be somewhat limited in handling the needs of big virtual organizations. Virtual organizations need a structure that is fast, reliable, adaptable and deterministic. In addition, these organizations need a structure to allocate resources and maximize their utilization in a way that avoids deadlock and priority inversion. The object-oriented approach is a structural approach that is uniquely positioned to undertake these complex demands. Approaches based on information technology (the object-oriented model) and others such as the monolithic and hierarchical approaches take their cue from computer operating systems in how to structure an organization. All approaches have a similar end goal. Yet apply different designs to structure and operate the organization.

2. Organizations: A Background

2.1 Virtual Organizations vs Virtual Offices
Traditional organizations are an alliance of manufacturing and administrative services that provide specific business needs. The services provided by any organization may include finance, IT, sales, marketing, operations, distribution, just to state a few. In a traditional organization setup, these services are located in a defined physical space for convenience of coordination, communication and resource
sharing. However, the setup is very different for a virtual organization which usually outsources most of these services and only keeps its core activities in-house. As such, the typical alliance of manufacturing and services for a virtual organization’s resources is located in virtual space.

Although many authors have addressed the concept of the virtual organization since it emerged almost 20 years ago, Lucas et.al. [1], there is no standard definition for the virtual organization concept yet. However, Quinn in [2] discussed that most successful enterprises can be considered “Intelligent Enterprises” converting intellectual resources into a chain of service outputs and integrating these into a form most useful for certain customers. Unless the facilities and manufacturing technologies are themselves part of the core competencies of the company, strategy dictates that they should be limited and selectively outsourced whenever feasible. On the other hand, Klein [3] argues that as the virtual organization consists of several independent organizations that function as a single entity, a virtual organization mainly depends on outsourcing all the organization’s activities such as finance, production, sales, IT, etc.

On the other hand, the virtual office consists of many organizational and technological elements that operate as a regular office does, yet they are not bound by a specific physical location. The virtual office concept suggests that employees are no longer bound by the management or the physical constraints of a conventional office space. To illustrate the concept, Thayer. [4] provides the example of sales people carrying their office in their portable computers; they communicate electronically, and make rare office appearances.

Designers of virtual offices use three methods to accommodate human resources and allocate space: Hoteling, Moteling, and Telecommuting. As Smith [5] explains, Hoteling involves the use of unassigned offices that employees can reserve in advance for a specified period of time on a temporary basis, in the same way that business travelers reserve hotel rooms. Similarly, Hoteling can be described as the process of sharing space, where employees with varying work schedules rotate into common offices (Hoewing [6]). Moteling works along the lines of just-in-time office planning: in this case no advance reservation is required. Finally, telecommuting refers to employees working from home, with occasional visits to the office.

2.2 Management

As previously described, management is defined as the set of activities that plans, directs and maintains an environment in which employees work together, yet compete for organization resources, to accomplish a set of selected jobs or tasks effectively and efficiently. The resources of the organization can be tangible (e.g. faxes, printers, computers, and office space etc.) or non-tangible (e.g. managers’ time slots).

In that context, the most fundamental management task is setting the organization structure. Mintzberg [7] states that “every organized human activity...gives rise to two fundamental and opposing requirements: the division of labor into various tasks to be performed and the co-ordination of these tasks to accomplish the activity.” From that perspective, the organization structure can be simply defined as the sum total of ways in which the organization divides its labor into performing specific tasks and then coordinates between those tasks to perform the ultimate activity or service required. However, a vital problem that faces management is how to organize and coordinate different tasks with time constrains as well as dependence constrains to achieve the final goal or objective of the organization (Mintzberg [7] and Lucas et.al. [1]). In that sense management is quite comparable to operating systems like UNIX, Windows, or Apple OS; operating systems can be viewed as managers of resources (hardware and software).

2.3 Management Challenges

While managing traditional organizations is considerably a difficult task, the difficulty is compounded when managing virtual organizations given that partners and employees are managed and organized remotely. The concept of the virtual organization introduces new management and coordination challenges. The problem gets even more complicated when
the number of partners increases in the case of virtual organizations, or the number of employees increases in the case of virtual offices. As Thayer [4] points out, a manager can no longer walk down the hall and grab someone to do an urgent job. For a more elaborate discussion on difficulties as well as advantages of managing virtual organizations, see Klein [3].

A major problem that faces the management of both virtual organization and virtual offices is resource allocation to employees in a way that ensures maximum utilization of those resources. With large organizations, whether traditional or virtual, the most important resources are the time slots of employees, managers, directors, and CEOs. However, there are many other resources that can be used by only one job at a time. In a more realistic setting, a job may even require exclusive access to not only one, but several resources at the same time or at different times (for example, an employee can request an IT expert, a laptop and a printer all at the same time in order to perform one task or job). At times a job can hold a resource while waiting for another resource to become available to finish the job (for example, an employee may already have access to a laptop and a printer but needs the IT expert to fix something before the job can be done). In virtual organizations and offices this may cause serious problems to arise i.e. deadlock, process starvation, and priority inversion.

In addition to effective resource allocation, another problem that faces management is setting a proper organization structure that ensures effective communication and coordination between departments. In that respect the proper structure will set the guidelines for all the reporting mechanisms that govern the workflow of the company and the communication mechanisms between its employees.

The Corporate Executive Board [8] conducted a study which compares between the five basic organization structures from the strategy point of view. In its study, the Council provides a description for each structure and its advantages, disadvantages, and characteristics. In their view, Kubrak et.al. [9] maintain that companies with strong organizational structures benefit from a defined hierarchical structure, improved communications, and the ability to produce a unified company message. Effective communication is required to keep an organizational structure running smoothly and is critical to its success, and without it, new ideas and processes can get confused and managers may redouble efforts to claim certain parts of a process as their own. Communication difficulties become more pronounced in a virtual organization due to spatial considerations and because of the multitude of tasks, functions and requirements management can become difficult if not impossible with traditional management tools and techniques.

It is at this stage that constructing an intelligent, organic structure model proves helpful in managing the virtual organization’s processes and resources especially in assisting management in maximizing resource utilization and eliminating problems like deadlock, priority inversion, or processes starvation. However, it is worth noting here that such problems can be avoided if resources were not shared by more than one job (thus eliminating the concept of resource sharing) and if each job could have its own set of dedicated resources. However, this is an unlikely scenario as “work will continue to increase, but internal resources will not,” Norman et.al. [10]. Even if it were possible, it would typically be cost prohibitive.

Cordeiro, et.al. [11] argue that co-ordination is a fundamental aspect of organizational activity where computers can help. This is motivated by the need to reconcile the conflicts that arise from the division of labor that characterizes any organizational structure and that is present in almost all business processes.

To tackle all the coordination, communication and resource allocation issues listed above, different companies set up unique organizational structures that fit their own needs. However, there are several basic types of organizational structures that are the spring board from which these tailor-made structures arise. The three most common types are: the functional structure, the
divisional structure, and the product structure. Other types of organizational structures may include geographical structure and process structure.

One of the more commonly used organization structures is the matrix structure presented by Bartlett et al. [12] who argued that “Top-level managers in many of today’s leading corporations are losing control of their companies. The problem is not that they have misjudged the demands created by an increasingly complex environment and an accelerating rate of environmental change, nor even that they have failed to develop strategies appropriate to the new challenges. The problem is that their companies are organizationally incapable of carrying out the sophisticated strategies they have developed. Over the past 20 years, strategic thinking has far outdistanced organizational capabilities.”

Thomas et al. [13]—basing their findings on surveys, interviews, and workshops with 294 top-level and mid-level managers from seven major multinational corporations in six industries—identified the matrix structure’s top five challenges: misaligned goals, unclear roles and responsibilities, ambiguous authority, lack of a matrix guardian, and silo-focused employees.

With the complexity of present day virtual organizations, the structure and design of their internal structure has become integral to the efficiency of the whole process and organizations designers’ main focus is to solve the problem of managing processes competing for resources with certain basic requirements (a bare minimum) in mind. The best virtual organization structure system is:

1. Fast, to minimize the average response time for the set of tasks managed.
2. Efficient in resource utilization, which is the time using the resource compared to the time the resource is available.
3. Adaptable, so that small changes in the system can be carried out easily and smoothly, and only affect well defined entities.
4. Reliable, in terms of system performance.
5. Deterministic, in the sense that for each possible set of inputs, a unique set of outputs will be determined after a precise time.

3. Virtual Organization—The Object-Oriented (Organic) Structure

Where the object-oriented approach is concerned, the structure of the virtual organization is viewed as a collection of objects. One type of object may be a task or a process. Other types of objects may include IT resources, employees, time slots, managers, managers’ time slots, synchronization primitives, and an endless variety of other objects. Each object contains a set of rights that define the operations applicable to that object. Interactions among objects are determined by messages. The resulting structure is a network of objects interconnected by messages. The principles of abstraction are also applied; each object embodies an abstraction of some concept, it hides the internal implementation of that concept and provides a set of operations applicable to the object. The object-oriented paradigm reflects a methodology that is booming. The benefits gained in case of implementing object-oriented models include:

- Simplicity of understanding, analyzing, and designing. Since object-oriented models are very close to mental models of reality.
- Stability over changing requirements. Objects are more stable than functions.
- Object-oriented models offer excellent support for modularity and encapsulation.
- Object-oriented methods provide a high degree of flexibility and reusability.

4. Ministry of Transport—Technology Department—Classical Structure

In 2010, the organization structure of Egypt’s Ministry of Transport (MoT) consisted of four deputy minister sectors: policies and planning, follow-up and coordination, funding and investments, and technology development. Two other functions reported directly to the minister but not at the sectorial level: projects management, and finance, administration, and human resources. Technological development was clearly an integral part of the Ministry’s structure (being at the level of deputy minister sector) and in fact it was the first time that the