AN EMPIRICAL INVESTIGATION OF THE
INTEGRATED WEAPON SYSTEM MANAGEMENT
CONCEPT OF "SEAMLESS PROCESSES"

THESIS

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AFIT/GAL/LAL/95S-7

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Abstract

This research investigated the way four Air Force Materiel Command (AFMC) single manager organizations operationalized the Integrated Weapon System Management (IWSM) concept of "seamless processes." In this thesis, the IWSM concept of "seamless processes" refers to the degree of integration between acquisition and sustainment organizations. Four SPO organizations were involved in six case studies. This research focused on the way "seamless processes" affect the shifting of the organizational "center of gravity" within or between single manager organizations. An interview questionnaire was administered to 13 Product Center managers and 6 Logistics Center managers. The interview questions focused on IWSM in general, "seamless processes," and the IWSM processes of transition and consignment. These two processes are the formal means for transferring product management authority, responsibility, and workload within and between single manager organizations. Research findings indicate that individuals, the nature of work, and the organizational structure affect the development of "seamless processes." Also, in organizations that have mitigated "seams" between acquisition and sustainment functions, transfer of product management authority and responsibility occurs informally. In other instances, product-specific or managerial issues create "seams" that require formal agreements delineating authority and responsibility relationships between Product and Logistics Center organizations.

AN EMPIRICAL INVESTIGATION OF

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I. Introduction

CHAPTER OVERVIEW

The General Issue and Specific Problem are described in this section. The General Issue describes the weapon system management environment and provides and overview of the Integrated Weapon System Management philosophy. The Specific Problem identifies the research objective and question. Additionally, an overview of the methodological approach, the findings and analysis, and the results and conclusions is presented.

GENERAL ISSUE

In July 1992, the Air Force Materiel Command (AFMC) was created by merging the Air Force Systems Command and the Air Force Logistics Commands. AFMC adopted Integrated Weapon System Management (IWSM) as its "<u>management philosophy</u> for acquiring, evolving, and sustaining" products (4:9). IWSM replaces the traditional centralized, functional stovepipe organizational structure with a functionally integrated structure directed by a single manager who has authority and responsibility

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to ensure that customer requirements are satisfied throughout the life cycle of a product. IWSM is different than previous weapon system management approaches because it matches processes and organizational structure to products. Products no longer flow through several diversified, bureaucratic organizations throughout their life cycles. Instead an organization is built around a product, and exists to specifically support that product from "cradle-to-grave."

IWSM is a hybrid philosophy that incorporates concepts from total quality management, concurrent engineering, and process and organizational reengineering. In this regard, IWSM, the Quality Air Force (QAF) program , and the Integrated Product Development (IPD)[1] program are interrelated and mutually supportive. The concept of "seamless processes" and organizations is particular to IWSM. Further, the seamless concept represents a "paradigm shift" in weapon system management.

In IWSM, "seamless processes" are critical concepts. "Seamless processes" represent the integration of acquisition and sustainment functions. Although these are discrete activities, the interdependency of each is recognized and integrated throughout product development, design, production, deployment, and sustainment. The creation of a single manager organization facilitates integration of acquisition and sustainment functions. A single manager unifies diverse units within the product organization and acts as a single face to the customer. Furthermore, multi-functional integration occurs within and between units in the organization. That is, not only is there integration, in broad terms, between the functions of acquisition and sustainment, but there is also integration of different program management functional disciplines within units. This

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[1] IPD is one of eight tenets of IWSM; the others are: Total Quality Air Force, Cradle to Grave, Single Face to User, Seamless Processes, Empowered People, Common Sense Approach, and Product Focus (3).

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integration is achieved through creation of integrated product teams (IPT). Finally, the organization exists to support a product from the Concept Studies Approval to retirement, i.e., from "cradle-to-grave."

IWSM is implemented to varying degrees in different organizations throughout AFMC. This is neither good nor bad. Each organization tailors IWSM to suit its needs. Additionally, IWSM is constantly evolving (4). Therefore, it is reasonable to expect that the degree to which IWSM is implemented in any organization will differ.

SPECIFIC PROBLEM

Research Objective. This research identifies how four different AFMC organizations operationalize the IWSM concept of "seamless processes." Toward this end, the processes of transition and consignment are investigated using a case study approach. The purpose of this approach is to learn how AFMC single manager organizations integrate acquisition and sustainment processes performed by both different functional elements internal to the product organization, and by external separate single manager organizations. A fundamental issue in the integration of acquisition and sustainment processes is how separate single manager organizations allocate authority and responsibility within their own organizations and between other single manager organizations to manage resources required to support a product throughout its life cycle.

Research Question. The research question is "How does the way selected AFMC organizations operationalize the IWSM concept of 'seamless processes' affect the shifting of the 'center of gravity' of product management from acquisition to sustainment units?" "Seamless" describes the processes and organizational structures

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that affect how individuals in functional offices, on integrated product teams (IPT), and at Product or Logistics Centers interact to perform acquisition and sustainment processes. "Seamless" refers to the integration of acquisition and sustainment activities (4). In this research, the concept of a "center of gravity" may be defined in two ways. First, the "center of gravity" for a weapon system program is based on the predominant activity, e.g., acquisition or sustainment, ongoing in the program, and the location of the System Program Director (SPD). Second, the concept of "center of gravity" may be defined in terms of the "mass" of work performed on a particular product, e.g., a subsystem or a component, without regard for the location of the single manager.

Difference from Previous Research on IWSM. This research differs from previous research because it focuses specifically on the IWSM concepts of "seamless processes" and "center of gravity." A fundamental premise of this research is that the concept of "seamless processes" is central to the IWSM philosophy. This research focuses on the relationship between "seamless processes" and shifting the "center of gravity." That is, how does the way organizations operationalize "seamless processes" affect shifting the "center of gravity."

Methodology. Similar to previous research on IWSM implementation efforts, this research uses a case study approach (7; 8; 23). Four organizations are involved in six case studies. All the case studies involved subsystem, and two organizations had two case studies each. In these studies, 19 managers directly involved in transition and consignment processes were interviewed. The were 14 civilian and 5 military interviewees from product centers (PC) or air logistics centers (ALC), and assigned to System Program Offices or Product Group organizations. The interviewees were

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stationed at the Aeronautical Systems Center, Warner-Robins ALC, Ogden ALC, Oklahoma City ALC, and San Antonio ALC.

The majority of interviews were conducted in-person, however, five interviews were conducted via telephone. An eleven-question interview protocol was used (see Appendix B). The questions were arranged from broad to specific, and asked for inputs on IWSM, "seamless processes," and the processes of transition and consignment.

Transition and consignment are IWSM processes in which product management authority, responsibility, and workload is formally transferred from one organization to another. Transition occurs between units within a single manager organization. Consignment involves the transfer of product management for subsystems or components between two or more separate and autonomous single manager organizations (2).

Data gathered during the interviews was analyzed and integrated by issue. A composite response to each question was developed. These responses represent the full spectrum of interviewee opinions and inputs.

Findings and Analysis. There were three common themes in the findings. First, successful IWSM implementation requires "personal commitment" to the tenets of the philosophy. Managers in the chain of product authority and responsibility must facilitate an IWSM environment for "seamless processes" to be achieved. Second, effective, constant communication between geographically separated elements of the same single manager organization or between different single manager organizations is essential to achieving "seamless processes." Third, the processes of transition and consignment present difficult issues that demonstrate the level of seamlessness in IWSM organizations. Both product-specific and managerial considerations affect these

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processes. "Up-front" planning and effective communication between PC and ALC organizations are critical activities that enhance these processes. Additionally, system stability, the availability of the proper engineering technical data, and resource concerns are three key issues affecting transition and consignment.

Results and Conclusions. In Chapter V, integrated information presented in the Literature Review and the Findings and Analysis chapters is synthesized and focuses on three issues. First, the differences between the Program Management Responsibility Transfer (PMRT) process and the IWSM processes of transition and consignment are evaluated. PMRT was the pre-IWSM process for formally transferring program management authority and responsibility. Comparing PMRT to transition and consignment highlights two significant differences. These are cradle-to-grave management, and allocation and control of funds. Second, a brief comparison of general findings on the weapons system organizational environment from previous research and this research is presented. In general, the findings in this research support five significant issues noted in previous research For example, cultural differences between PCs and ALCs, parochialism, "PMRT mind-set," divided authority and personnel performance rating chains, and the importance of communications are factors that affect the seamlessness of IWSM processes (7; 8; 23). In addition, the impact of individuals, the nature of work, and organizational structure affects the development of "seamless processes." Third, with respect to the first two issues presented, an answer to the research question was developed. In general, when a single manager decentralizes product management authority, and develops an integrated organization with empowered managers realizing "seamless processes" is possible. Furthermore, the way the concept of a "center of gravity" is defined affects

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the research question answer. When the "center of gravity" is defined in terms of the location of the single manager and the predominant processes involved in managing the overall system, then it does not appear that the degree to which "seamless processes" are realized has a significant impact. On the contrary, if the concept of "center of gravity" is defined in terms of specific products, e.g., subsystems or its components, the degree to which "seamless processes" are realized does have an impact.

CHAPTER SUMMARY

A brief overview of the General Issues and a Specific Problem addressed in the five chapters in this thesis was discussed in the Introduction. Chapters I through IV develop the concepts of "seamless processes" and organizational "center of gravity." In Chapter V, an integration of the salient issues, and an answer to the research question are presented.

II. Literature Review

CHAPTER OVERVIEW

This chapter is divided into four sections: Overview, Background, Review of Previous Research, and Summary. In the Background section, the program management environment is discussed in three subsections. First, background issues describing the implementation of IWSM and IPD are discussed. Second, the PMRT process is explained. Third, a description of IWSM and IPD focusing on the central concept of "seamless processes" is developed. In the Review of Previous Research section, previous IWSM and IPD implementation studies and surveys are discussed with respect to the factors affecting "seamless processes." In the Summary, the key issues affecting "seamless processes" are re-addressed.

BACKGROUND

Creation of AFMC and Development of IWSM. In July 1992, the merger of the Air Force Logistics Command (AFLC) and Systems Command (AFSC) created the Air Force Materiel Command (AFMC). AFMC is a 116,900 person organization that manages 14 bases and 45 percent of the total Air Force budget (17). The Integrated Weapon System Management (IWSM) philosophy was developed by AFMC to be its new management approach. IWSM is designed to integrate the different missions, processes, organizations, and cultures that existed in AFSC and AFLC. More specifically, IWSM integrates acquisition and support processes and organizations into "seamless" product-oriented, event-driven organizations whose primary goal is to meet customer requirements throughout the life cycle of a product (4).

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Implementation of IWSM began in 1992 when the newly formed AFMC identified 21 system program offices (SPO) for a pilot study. By December 1993, the Secretary of the Air Force for Acquisition approved implementation of IWSM in 79 of 110 program offices at both the Product Centers (PC) and Air Logistics Centers (ALC) (3). A major thrust of IWSM implementation is the consolidation of programs. In January 1992, there were over 850 programs, and through consolidation this number was reduced to 103 single manager programs by November 1994 (2). These consolidations were driven by the IWSM and IPD goals of increasing efficiency through integration, to better utilize diminishing resources throughout the product life cycle.

Program Management Responsibility Transfer. Prior to the merger of AFSC and AFLC in 1992, the most significant seam in management of a weapon system was the division of the acquiring and supporting organizations into separate commands (8). The process of Program Management Responsibility Transfer (PMRT) was the "hand-off" of weapon system management from the developing command, AFSC, to the supporting command, AFLC. These two commands had distinctly separate and different missions. These different missions produced different management approaches, attitudes and organizational cultures. Because system management was fragmented across the life cycle, neither AFSC nor AFLC managed from a "cradle-to-grave" perspective. In the case of the Product Center organizations in AFSC, this fragmented management resulted in design and development tradeoff decisions that saved money in the short term, but cost money in the long term, e.g., after PMRT occurred (8). Conversely, the Logistics Centers tended to approach system management with a goal of keeping risk to a minimum (8). The process of PMRT did not bridge the seam between the two commands, but instead perpetuated it by

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thoroughly defining and delineating authority over resources and system management responsibilities between the two commands. A discussion of the process will enhance this point.

The process of PMRT involved the formal transfer of PMR for a system, subsystem, or equipment item from the developing command, AFSC, to the supporting command, AFLC. The duties "transferred include engineering, procurement, configuration management, integrated logistics support, and financial management" (5:18-1). The PMRT process was planned by the SPO and the ALC through the Transfer Working Group (TWG). The TWG developed a PMRT plan that outlined "all actions, agreements, and events required for an orderly and timely transfer of PMR" at the earliest practicable date during the production phase (5:18-2; 10). The PMRT, ideally, occurred when the developing command's acquisition tasks were sufficiently complete and transfer would not result in duplication of acquisition management capabilities in the supporting command (5). The plan required approval from the responsible Program Executive Officer and the supporting command Designated Acquisition Commander, then final approval from the Air Force Acquisition Executive. After this review and approval process, the PMRT plan was used to update the Program Memorandum Directive (PDM).

The PMRT plan was a formal document which included a milestone schedule of responsibilities, system acquisition and transfer management functions (e.g., engineering, production, budgeting, funding, and contracting), residual tasks[2], a list of contracts requiring transfer, and any other program specific issues that required

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[2] A residual task is one that was initiated by the developing organization and must be completed after the PMRT occurs. These tasks are delineated in the Transfer Agreement portion of the PMRT plan and monitored by the TWG. Examples of typical residual tasks are funding for an open engineering change proposal or acquisition of long-lead support equipment (5).

coordination and agreement between AFSC and AFLC. This plan was prepared in a standard format, but contents varied based on program unique issues. Ideally, the PMRT plan was prepared in advance to ensure manning and budgeting issues were reconciled and programmed into the respective command budgets.

The PMRT process clearly defined the separation of responsibility for program management between the developing organization and the supporting organization. Because a major system may consist of hundreds of subsystems and components, PMRT often occurred in stages, not at one point in time. That is, the entire weapon system was seldom transferred in one discrete event; instead, portions of weapon systems were transferred as production was completed and support capability was achieved. For example, an aircraft system might undergo PMRT between ASC and Ogden ALC as it neared completion of production, but the electronic warfare components or engines might not undergo PMR simultaneously because management of these components was assumed by Warner-Robins ALC and Oklahoma City ALC, respectively. Therefore, separate PMR agreements were required with each supporting agency assuming weapon system management responsibility. In each case, PMRT resulted in a complete separation of responsibility from the developing organization.

Also, the process was irreversible (14). Once the PMRT process was complete the SPO was dissolved (14). Under this management approach there was no overall single manager for a system, but several organizations managed the system throughout its life cycle. This fragmented control and required the user to work with several different organizations, none of which had central authority over the entire system. IWSM and IPD are designed to integrate the fragmented organization into one product organization. Eliminating the "seam" between the acquiring functions and the

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sustaining functions is a paramount concern in developing seamless weapon system management processes.

IWSM: A Management Philosophy. IWSM is a continuously evolving system of management in which "the whole is truly greater than the sum of the parts" (4:1). IWSM is defined by its eight tenets, and operationalized by each organization that implements this management philosophy. IWSM is a "management philosophy for acquiring, evolving, and sustaining our products. It empowers a single manager with authority over the widest ranges of decisions and resources to satisfy customer requirements throughout the life cycle of the product" (4:9). IWSM is intended to increase the system program director's authority and flexibility, and to integrate eight critical processes to eliminate the 'seams' that existed between development and support organizations (4).

Key Elements of IWSM. In November 1992, four "key element" of IWSM were identified in a white paper issued by General Yates, AFMC Commander. These elements are: "single face to the user; cradle-to-grave; seamless organization; and Integrated Product Team (IPT)" (4:42). Understanding IWSM requires an explanation of each of the key elements. First, the single face to the user is the single manager. This position has the "authority over the widest range of product decisions and resources to satisfy customers' requirements throughout the system/product/ materiel life cycle" (4:42). Second, cradle-to-grave management involves evaluation of all program decisions from a life cycle perspective. The life cycle is from the Milestone I decision until the product is canceled or retired. A key point in this concept is the requirement to balance all decisions across a life cycle and to eliminate the PMRT process. Incorporation of sustainment and supportability issues into the development

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process is critical. Third, a seamless organization manages eight critical processes that are integrated across the product life cycle. Integration occurs between acquisition and sustainment organizations, and between all different disciplines involved in weapon system management. Fourth, integrated product teams use a multi-functional approach to manage and integrate eight critical processes. "Teams are the heart of IPD [Integrated Product Development]" (3:12). Teams have two objectives First, to create a sense of product ownership by team members. Second, to break down functional barriers (3).

Tenets of IWSM. These four key elements evolved into eight tenets to define the IWSM philosophy. These eight tenets are interrelated and interdependent (4). They are:

1. Total Quality Air Force
2. Cradle-to-Grave
3. Single Face to User
4. Seamless Processes
5. Empowered People
6. Common Sense Approach
7. Integrated Product Development (IPD)
8. Product Focus

In the IWSM Guide (4) these eight tenets are defined as follows: First, Cradle to Grave, Single Face to User are defined above. IPD is explained in the next sub-subsection. Second, Total Quality Air Force or QAF is broadly defined as a leadership commitment to a management style that inspires teamwork, trust, and continuous improvement throughout the Air Force. Third, Seamless Processes are managed by "seamless organizations." Ideally, there are no process seams between organizations, locations, or programs. The single manager leads his/her organization to perform eight core product management processes. The eight core processes are (4):

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1. Product Management
2. Requirements
3. System Engineering and Configuration Management
4. Financial Management
5. Contracting
6. Technology Master Process
7. Logistics
8. Test and Evaluation

Fourth, Empowered People includes the single manager and all the individuals in that organization. Authority and responsibility must flow to the lowest level possible, and a sense of ownership and responsibility for products and processes must be created. Fifth, Common Sense Approach means "Do what's right; fix it if it doesn't make sense" (4:13). And finally, Product Focus is the shift in focus from internal efficiency to ensuring the product meets customer requirements.

Integrated Product Development. Integrated Product Development (IPD) is one of eight tenets of IWSM. Of all the tenets, IPD is most closely related to the essence of IWSM. In fact, it is difficult to differentiate between the two concepts. Similar to IWSM the "compelling reason driving the implementation of IPD within AFMC is to maximize our limited resources, while delivering a higher quality product to our customers; not by doing more with less but by making the right decisions within the resources available" (3:9).

AFMC incorporates IPD as an integral "strategy for managing" and integrating functional activities. The outcome of this process should be a prioritized focus on: "the customer, the product, the process, constraints, and organizational structure" (3:6). Additionally, IPD "systematically employs a teaming of functional disciplines to integrate and concurrently apply all necessary processes to produce an effective and efficient

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product that satisfies customer's needs" (3:5). In essence, IPD seeks to create seamlessness in AFMC organizations.

Similar to IWSM, IPD contains eight tenets. Briefly these tenets are (3):

1. Cultural Change
2. Product Focus
3. Up-front Planning
4. Right People-Right Place-Right Time
5. Teamwork and Communication
6. Empowerment
7. Seamless Management Tools
8. Integration Throughout the Life Cycle

In lieu of a detailed description of each tenet, suffice it to say that these tenets, in the aggregate, promote "seamless" weapon system management across the product life cycle.

With IWSM and IPD the single manager organization spans both traditional organizational, cultural, and geographic boundaries of the formerly separate acquiring and sustaining organizations. The single manager is charged with creating an organization that enables the creation of "seamless processes" by fostering interdisciplinary and intra- and inter-organizational teamwork.

Seamless: A Central Concept. Throughout the IPD Guide (3) and the IWSM Guide (4) the concepts of integration and "seamless" are used to describe processes, organizations, and the product life cycle. For example, there are "seamless organizations," "seamless processes," "seamless management tools[3]," and a goal of eliminating the "seam" between acquisition and sustainment and "seams" along mission or functional boundaries. "Seamless" describes the processes and organizational structures that affect how different functional offices and people, and

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[3] Tools are described as "documents, data systems, and methodologies which provide a shared framework for planning, tracking, and executing a product or activity. The primary purpose of tools is to enable the

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different units in the product[4] organization interact (4). Application of IWSM concepts

and principles is designed to create a "seamless" management system of processes

involved in acquiring and sustaining a product. This includes a "seamless organization"

within a unified command; a single weapon system manager who retains product

management responsibility and authority throughout the entire product life cycle; and a

"seamless" perspective of the weapon system life cycle encompassing all events from

concept exploration to retirement of a product (4).

"Seamless processes" and "seamless organizations" are interrelated concepts

that may be understood by describing the role of the single manager. The authors of

the IWSM Guide state that the "single manager must ensure that his [seamless]

organization operates in an integrated way simultaneously within each process and

across all the [seamless] processes" (4:13). Additionally, "seamless management

tools" are used by the single manager. Seamless management tools are described in

the IPD Guide as

> A framework....that relates products and processes at all levels to
> demonstrate dependency and interrelationships. This hierarchical
> interrelationship must be understood and appropriate partnerships
> established to make sure all decisions are optimized toward the ultimate
> user's end product. A single management system must be established that
> relates requirements, planning, resource allocation, execution, and program
> tracking over the total life cycle. This integrated approach ensures teams have
> all the available information to enhance team decision making...[original in bold].
> (3:8)

These "tools" are designed to support the accomplishment of "seamless processes". In

a more general perspective, "seamless management tools" may be interpreted as the

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cross-functional IPT to share and integrate information and make decisions at the lowest level
commensurate with risk" (3:12).

[4] A "product" in the IWSM philosophy refers to both the item delivered to the customer, such as the
hardware or sofware that constitutes a system, and the processes (e.g., design, production, test, etc.) that
make the product possible. "Products range from complete weapon systems to individual end items" from
documentation to policies to operational processes (3:5).

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integrated performance of processes in which functionally different or geographically separated units in the same organization interact (16).

Single Manager. The IWSM and IPD single manager paradigm involves "product focus," "centralized control," and "decentralized execution" (3). Figure 1 shows a single line of authority and responsibility from the Program Executive Officer or the Designated Acquisition Commander[5] to the system single manager. Single managers direct the combined acquisition and sustainment activities that integrate efforts of individuals in different functional disciplines at both Product Centers and the Air Logistics Centers. Additionally, the single manager may be a System Program Director (SPD) who manages both acquisition and sustainment of a weapon system, a Program Group Manager (PGM) who manages the sustainment and continued modification of fielded weapons systems, or a Materiel Group Manager (MGM) who manages the sustainment of mature, fielded weapons systems[6].

The single manager position is a key element in the "seamless" concept. AFMC defines the single manager as the "single business decision authority" empowered to utilize resources throughout the command to enhance flexibility and responsiveness to customer needs (4). Abrams states that "the single most important variable in program or project management is authority" (1:18.4). Moreover, this authority transcends both functional and organizational boundaries. The single manager retains responsibility

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[5] There are six Air Force Program Executive Officers (PEO) who are directly accountable to the Air Force Acquisition Executive for management of a functionally similar group of major weapon systems. The six PEO categories are: bombers, information systems, tactical/airlift systems, space systems, command-communications-control systems, and weapon systems. Designated Acquisition Commanders (DAC) manage non-major weapons systems, such as acquisition category III and IV programs. DACs are typically Product or Air Logistics Center Commanders (19).

[6] A Product Group Manager (PGM) manages several similar products, in all phases of the life cycle, and involve a large sustainment effort and a smaller ongoing development effort. A Materiel Group Manager (MGM) manages sustainment of several like products. The group is arranged to take advantage of economies of scale and specialization of technical and engineering expertise. Also, products in this group are typically not undergoing continuing developmental efforts (4:10). PGMs and MGMs are typically located at an Air Logistics Center, and an SPD is usually located at a Product Center.

and authority for product requirements and customer satisfaction regardless of the product's life cycle stage. Therefore, the single manager position is critical to building a unified organization that integrates the acquiring and sustaining functions formerly managed by separate commands. This is achieved by locating the single manager at the program's "center of gravity," either the PC or the ALC, depending on which activity, e.g., development, production or modification, or sustainment of fielded systems, is the predominant focus of product management.

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┌─────────────────────────────┐        ┌───────────────────────────────┐
│ Program Executive Officer   │   or   │ Designated Acquisition Commander│
└─────────────────────────────┘        └───────────────────────────────┘

                    ┌──────────────────┐
                    │  Single Manager  │
                    │  SPD, PGM, MGM   │
                    ├────────┬─────────┤
                    │  DSM   │   SSM   │
                    └────────┴─────────┘

┌─────────────────────┐              ┌──────────────────────────────────┐
│   System Level      │              │        Product Level             │
│ Functional Staff    │              │ Product A IPT -------- Subgroup A │
│ Projects            │              │ Product B IPT ------- Subgroup B  │
│ Logistics           │              │ Product C IPT ------- Subgroup C  │
│ Finance             │              └──────────────────────────────────┘
│ Engineering         │
│ Contracting         │
│ Legal               │
│ Test                │
└─────────────────────┘
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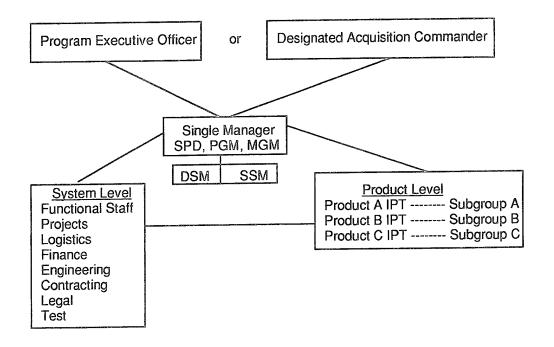
FIGURE 1. INTEGRATED ORGANIZATION (3:20)

In addition to being the linchpin of integration between the acquiring and sustaining parts of the organization, the single manager must develop an organizational culture that enables functional integration at the team level. That is, the single manager must allow evolution of the organization climate to facilitate open

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communication within and between IPTs, and ensure that the IPTs have the time, resources, and manpower required to perform "seamlessly" (3).

The complexity and long term nature of system acquisition and sustainment necessitates an integrated organization that enhances the efforts of all disciplines, e.g., program management, contracting, logistics,.... These functional disciplines perform eight core processes under the IWSM philosophy. Abrams states that these processes represent a "greater aggregation" when managed by a single manager under a seamless life cycle framework (1). Overall, centralization of responsibility in a single manager was designed to eliminate time, process, and organizational barriers that previously inhibited optimizing product cost-schedule-performance factors throughout a product's life cycle.

Shifting the Center of Gravity. An IWSM organization has a "center of gravity. This concept has more than one meaning. The concept way be defined in terms of the whole system or in terms of individual products in the system. When defining the "center of gravity" in terms of the whole system, the concept refers to the location of the single manager or the predominant process in the program, e.g., acquisition or sustainment. On the other hand, the "center of gravity" may also be applied to specific subsystems or components. In this sense, the "center of gravity" is based on the predominant process in which the majority of effort and investment is occurring, without regard for the location of the single manager.

The concept of a "center of gravity" is particular to IWSM. Under the two command program management system, AFSC had weapon system development and production responsibilities, and AFLC had the supporting and follow-on system development or upgrade responsibilities. There was a clearly defined "seam" in system

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management. In this pre-IWSM arrangement, program management authority, responsibility and workload was allocated to a Product Center (PC) during system development and production activities. PMRT was a clear break between these acquisition activities and providing system support. Following PMRT, authority, responsibility, and workload shifted to ALCs for the remainder of a system's operation. PMRT, which ideally occurred anytime from six months before to six months after the completion of system production, represented the disengagement of PC organizations and "hand-off" of program management to ALC organizations. Under IWSM, the PMRT process was replaced by the processes of consignment or transition. Ostensibly, through one of these processes, a "center of gravity" in product management shifts from the PC to the ALC. "Shifting" implies that organizations from both PCs and ALCs participate in product management activities throughout the life cycle. An explanation of transition or consignment will demonstrate how these processes differ from PMRT.

IWSM Process of Transition. Transition, also referred to as workload transfer, involves a shift in the "center of gravity" from the PC to the ALC. In this instance, the SPD position of a major system is relocated to the sustaining ALC because the focus shifted from developing and producing to sustaining an operational system. Transition occurs within the same product organization. It involves transferring product management authority, responsibility, and workload from PC to ALC organizations.

Within the product organization, the SPD may have one of two deputies that manage either development or sustainment depending on the location of the SPD. Typically, prior to transition, an SPD is located at the PC, and a System Support Manager (SSM) is located at the ALC where the sustainment activities will occur when

the system is operational. Similarly, when an SPD is located at the ALC, a Development System Manager (DSM) directs any residual tasks or ongoing system development at a PC. The arrangement of SSM and DSM, the timing, extent of the workload transfer, and specific subsystems transitioned are at the discretion of the SPD. A key point is that authority, responsibility, and control over product management remains with the SPD regardless of the location of the "center of gravity. "

IWSM Process of Consignment. Consignment differs from transition in that authority, responsibility, and control over product management is transferred from one single manager to another, such as a Product Group Manager (PGM) or a Materiel Group Manager (MGM). Whereas transition applies to major systems, consignment applies to subsystems, equipment items and components (2). The consignment process involves a delineation of the functional responsibilities to be assumed by the PGM/MGM from the major system SPD. This may be formally documented in a Memorandum of Agreement (MOA).

The timing of consignment is at the discretion of the SPD and the gaining PGM/MGM. Timing may be based on "maturity indicators" (13). These are benchmarks used to evaluate the status of product development and system stability (13). "Maturity indicators" are qualitative and quantitative measures of funding, provisioning, technical and reprocurement data, functional and physical configuration audits, depot support plans, and an assessment of integration risks that describe the conditions under which consignment should occur (13). These indicators may be used for transition also.
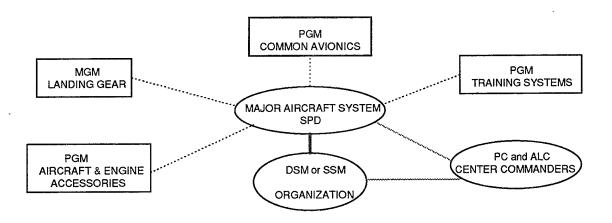
Consignment, similar to PMRT, involves a transfer of product management authority and responsibility from a developing organization to a separate and autonomous sustaining organization. The sustaining PGMs/MGMs have decision

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authority to make modifications to the subsystem or component. Ideally, these decisions are coordinated with the parent system SPD through a Joint Configuration Control Board or through some other integrated team. When a component is consigned, the SPD remains involved with its management by providing interface in the major system customer and by providing technical assistance for total system integration of modifications.

Many of the same functions and issues that were addressed in the PMRT plan are addressed in consignment MOAs. Manning issues, delineation of functional duties, and methods of future coordination are addressed to define the working relationship between separate, but interdependent single manager organizations.

To display these relationships, Figure 2 depicts hypothetical interaction between different single managers, e.g., the SPD, PGM, or MGM organizations. The major system organization is enclosed in the ellipses, and the associated PGM and MGM organizations are enclosed in rectangles. The lines connecting the organizations represent integrated system management. Additionally, the dotted lines connecting the major aircraft system ellipse with the various PGM and MGM rectangles show the inter-organization linkages created by consignment. Similarly, the line between the SPD and the DSM/SSM ellipses indicates the intra-organization linkage created by transition. Finally, the PC and ALC Commanders are depicted because of their control over resources at the Centers. The Center Commanders affect all single manager organizations, although only the SPD and DSM/SSM organizations are connected by lines. The Center Commanders have an equally significant affect on PGM and MGM organizations.

<u>Comparison of PMRT, Transition and Consignment</u>. Although there
may be similarities among PMRT and transition or consignment, the processes are not
identical. PMRT represented a significant "seam" in system management, and
transition or consignment bridges that "seam." Unlike PMRT, transition and
consignment fuse the "seam" between acquisition and sustainment activities by placing
management under a single organization or by developing inter-organizational teams to
provide integrated management. Under IWSM, it is important to note that the SPO is
not dissolved when the system is transitioned, or when subsystems are consigned.
The single manager organization, whether it resides at the PC or at the ALC, provides
"cradle-to-grave" management and a single face to the operational customer.

FIGURE 2. SINGLE MANAGER INTRA- AND INTER-ORGANIZATIONAL
RELATIONSHIPS (4)

Issues such as manning, finances, delineation of functional responsibilities for
residual tasks and future modifications, control over configuration changes, etc., were
addressed under PMRT and are still relevant issues in the transition or consignment
processes. Recent research indicates that several of these issues affect the
seamlessness of IWSM organizations.

REVIEW OF PREVIOUS RESEARCH

Previous research on IWSM and IPD implementation was reviewed to identify issues affecting the seamlessness of IWSM organizations. Specifically, emphasis was placed on issues regarding aids or barriers to creating "seamless" processes and organizations. Since 1992, there have been four academic studies on different aspects of IWSM. In addition, individual organizations, the Centers, and AFMC have used metrics to measure the degree of change throughout the command. In this section, the results of these studies and surveys are discussed with respect to issues affecting the seamlessness of IWSM organizations.

AFMC IPD Implementation Metric Survey. Surveys measuring the degree of implementation of the eight tenets of IPD were administered at PCs, ALCs, and at HQ AFMC in January and July 1994 (17). The exact sample size and the exact number of respondents was not available. The results from 17 Centers, excluding HQ AFMC, are shown in Table 1, "Jan 94" and "Jul 94." These results are a composite measure derived by calculating a grand mean for each tenet; standard deviation was not available. These surveys were based on a DOD-developed climate survey. In this regard, none of the questions specifically refer to IWSM or IPD, although the wording of the questions capture the goals in these concepts. For example, the word "quality" or the concept of "improvement" appears in 11 of 40 questions. Additionally, the terms integration, customer involvement, cooperation, leader behavior, effective use of people, etc., appear throughout the questions.

TABLE 1. IPD IMPLEMENTATION SURVEY RESULTS (17)

IPD TENETS	Jan 94	Jul 94	Dec 94
Cultural Change - multi-functional focus on customer, product, process	4.2	4.5	→
Product Focus - focus with processes that optimize the product	4.0	4.1	↑
Up-Front Planning - integrate life cycle planning including customers	4.0	4.1	→
Right People, Place, Time - concurrent focus, multidisciplinary teams	4.2	4.0	→
Teamwork/Communication - open comm., teamwork rewarded	3.9	4.1	↑
Empowerment - decision-making at lowest level, diffuse authority	3.8	4.0	↑
Seamless Management Tools - product and process interrelationships	3.6	4.2	→
Integration - continuity of management throughout product life cycle	3.8	4.1	→
Overall	**3.9**	**4.2**	

NOTE: Sample selection techniques varied at each Center. The number of respondents in the samples and the standard deviation for the January and June 1994 surveys were not available. The December 1994 PER findings were based on interviews with approximately 200 people (16).

From survey data, the degree of IPD implementation is determined by the average score of responses on a Likert scale, with "1" meaning "strongly disagree" and "6" meaning "strongly agree." On this scale, 3.5 is the midpoint. This measure provides a subjective assessment of the importance of a given factor to individuals in an organization. This is a snap-shot description. There is no way to measure a relative change. For example, there is no comparable measure of the perceived importance of quality before versus after the implementation of IWSM and IPD. Therefore, one cannot say that quality, or any other IWSM or IPD tenet, is now more important than prior to implementing IWSM and IPD.

The results from an AFMC Process Effectiveness Review (PER) are also displayed in Table 1, in the column labeled "Dec 94." The PER findings are from interviews of more than 200 people at 6 different Centers (16). The PER team evaluated interview comments to conclude whether IPD implementation of the eight

areas increased, decreased, or had no change since the July 1994 measurement. The evaluators note that their conclusions are subjective.

In these surveys, the tenet "Seamless Management Tools" is of interest. In this category, the respondents were ostensibly evaluating the degree of seamlessness in product management. In other words, to what degree does the PC and the ALC interact in an integrated manner in performing weapon system management processes (16)?

Review of Findings from Previous Research. In addition to organizational metrics and Center and command level surveys, three theses investigated different aspects of IWSM implementation efforts since 1992. There are many similarities in the results of these theses and the PER findings. The findings identified in this chapter focus on aids or barriers to creating seamlessness in acquisition and sustainment processes and organizations. In general, the researchers found that differences between the acquiring and sustaining organizations affected the implementation of "seamless" organizations and processes. Five factors affecting IWSM implementation were identified in all three theses. Specifically, cultural differences between PCs and ALCs, parochialism, PMRT mind-set, divided authority and personnel performance rating chains, and inter-organizational communications are factors that affect seamlessness of IWSM processes and organizations (7; 8; 23).

Culture Change Affects Seamlessness. Cultural change was a common thread in the findings. AFMC defines cultural change as "the move from the functional focus to one based on products and multi-disciplined teams. The sequence of focus for IPD includes: the customer, the product, the process, constraints, and organizational structure" (3:6). Integrated teams must focus on the customers' needs.

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This focus guides the type and manner of processes used by teams. Also, the customer, the product, and the organization act as constraining factors on multi-disciplined teams. These relationships may require modification to current processes, development of new processes, and changes to organizational structure (3).

The merger of AFLC and AFSC occurred at the same time as the implementation of IWSM and IPD. This merger was intended to create a "seamless organization" to manage weapon systems. It was not intended to obliterate the differences between the acquisition and sustainment communities.

Dalrymple and Pietraszuk claim that the "biggest hurdle" in implementing IWSM was the existence of a "vast cultural divide between the support and the acquisition environments" (8:119). This perspective was noted in the findings of many studies (7; 16; 23). In part, this "divide" is a product of different mission and processes performed by the acquiring or the sustaining organizations. For example, the mission of acquisition organizations is to manage risk during development and production. This sometimes leads to optimizing near-term cost-performance, which may be detrimental to supportability considerations (8). Conversely, the support organization is risk averse and focuses on supportability over a relatively long period (8).

This characterization was echoed in a June 1994 Aeronautical Systems Center (ASC) survey. One respondent noted that the "ASC product orientation vs. the ALC functional process orientation is the biggest source of frustration because it seems to generate 'business as usual, leave us alone,' PMRT attitudes on both sides" (21). Coronado and Kweicinski note that several ALC personnel believed that full integration under IWSM was unlikely "as long as there are separate development and support organizations at separate locations" (7:98). In other words, some people believe that

creating a single manager and increasing interaction between acquisition and sustainment organizations will not sufficiently reduce the divergent perceptions of organizational self-interest inherent in the different missions of PCs and ALCs.

The PER team observed instances of similar "us" and "them" mind-sets that mitigated "seamless" cohesion. The evaluators noted two potential reasons: work assignment between PC and ALC is allocated by precedent, not by location of expertise or "center of gravity," and misunderstanding concepts and terminology inherent in the functional differences of product development and product sustainment (16).

Parochialism Affects Seamlessness. In addition to mission-based cultural barriers to IWSM implementation, recent research identified parochialism as a factor. In general, parochialism may exist in any large and diverse organization where managers are charged to protect their unit's self interest. This is often most evident when manpower and finances are scarce resources. The same holds true regarding the new relationship between PCs and ALCs. Under IWSM, the Center commanders retain control over manning authorizations in the product organizations (4). Center commanders "own" manpower positions and are unwilling to relinquish them for no return (8). Transition, shifting the single manager from the PC to an ALC, requires a realignment of manning to support new offices and to re-employ PC personnel. In some instances, a "rice bowl" mentality towards manning inhibited IWSM implementation (8). In one extreme example, an ALC manager prevented people from receiving acquisition training required to facilitate interaction with the PC because he/she feared those manning positions would transferred to the PC (8). Additionally, "the inability of the SPD to control and acquire SSM manpower necessary for program

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sustainment" is a significant obstacle that "undermines the IWSM tenet that the SPD is responsible for all facets of the program - cradle-to-grave" (21).

In a recent survey of consignment issues affecting ASC programs, "manning" was noted as a significant issue (24). In fact, the survey reported that a lack of "quantifiable manpower" in program Concepts of Operations (CONOPS), insufficient manning in certain functional specialties at the sustaining ALC, and Center manpower ceilings were adversely affecting the consignment process (21).

Efforts to integrate at the team level, in some instances, are confounded by constrained manning and budgets. This is similar to the problem of "lack of resources" identified by Van de Ven as a barrier in efforts to perform organizational change in public institutions (22). For example, IPT members are forced to divide their efforts between several teams due to limited manning (7; 10; 23). The PER team noted that it is difficult for "functionals" supporting several teams to have any team's best interest in mind. This results in a "'matrixed' mind set" of supporting each team similarly. Developing mixed organizational structures incorporates the advantages and disadvantages of each form. In general, simultaneous efforts to "right-size" and integrate functions prevents integrated teams from operating as designed.

PMRT Mindset Affects Seamlessness. In addition to manpower issues and parochialism, the elimination of a formal PMRT affects "seamlessness" in IWSM organizations. Planning for changes in resource allocation to accommodate development of the sustaining organization at the ALC is less clear without PMRT (21). "The old PMRT process was well defined with residual tasks spelled out clearly; now the concept of consignment and/or workload transfer [i.e. transition] is more difficult to

execute, especially in an environment of downsizing and reluctance to take on work without added resources" (21:1).

Although similar procedures occur when the SPD moves from the PC to the ALC, there is uncertainty in the timing and in assignment of responsibility for transition actions. Previous research efforts noted that the SPD now determines when to transition system responsibility from a PC to an ALC. Ostensibly, the SPD may be influenced to postpone the move for the PC's self-interests (7; 8). This is similar to the problem involving "work assignment by precedent" noted by the PER team.

Divided Authority and Personnel Rating Chains Affect Seamlessness. Previous research also identified divided authority and personnel rating chains as factors adversely affecting IWSM implementation. For example, there are cases when the depot is activated, but the SPD has not moved from the PC. In this instance, the ALC representative, who is the SPD's deputy, is responsible to both the SPD and the ALC commander. Additionally, this same individual's performance report is written by the SPD, but indorsed by the ALC chain of command (8). This convoluted chain of command is a carry-over from when weapon system management was divided between two commands. Under the former two organization set-up, the Deputy Program Manager for Logistics was filling an AFLC manning position, but was responsible to and rated by the Program Director (in AFSC), and indorsed by an AFLC superior.

Communications Affects Seamlessness. This review of research findings has focused on factors that inhibit the creation of "seamless processes" and organizations. This is not representative of all experiences in implementing IWSM and IPD. For each instance of barriers noted, there are examples of methods to obviate

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barriers. For example, advances in communications between different elements of the single manager organization were consistently noted in studies and measures of IWSM implementation. Three studies noted increased use of electronic communications due to unification of geographically separated units into one organization (7; 8; 23). Bridging the gap caused by geographic separation is essential to achieve full integration. Davenport claims that a "key benefit of IT [information technology]" is "the ability to overcome geography" (9:53). IPTs with members from both the PC and ALC increased use of fax, electronic mail, teleconferencing, and video teleconferencing (VTC) (7; 8;16; 21; 23). In one instance the SPO, located at the PC, funded the installation of an electronic mail system at the ALC (8). This is significant. Under the former, separate command structure allocation of funds across commands and bases would not have been possible. Now that the weapon system single manager "owns" both the acquiring units and the sustaining units, these types of "seamless" activities are possible.

A unified, product-oriented organization is better suited to enable the designing-in supportability characteristics than the previous separate command structure. In fact, in many cases joint Configuration Control Boards (CCB) include ALC engineers with the development team. Regarding CCBs, Dalrymple and Pietraszuk observed an increase in the use of electronic communication between Board members from several organizations (8). Typically, this involved both tele- and video-teleconference communications. The PER team noted similar findings (16).

CHAPTER SUMMARY

IWSM is AMFC's management philosophy. A central objective of IWSM is to produce "seamless" system management processes and organizations. The single manager is a key position in the IWSM organization. This individual maintains responsibility and authority for acquisition and sustainment processes throughout a product life cycle. Prior to IWSM, functional and geographic divisions between AFSC and AFLC created a significant "seam" in system management. The process of PMRT perpetuated this division by clearly delineating a separation of authority and functional responsibility. Under IWSM, PMRT was replaced by the processes of transition or consignment. Transition links the acquiring and sustaining units of a single manager organization, and consignment links separate single manager organizations through integrated management activities. The purpose of these arrangements is to increase effectiveness in product management by providing a consistent "single face" to the customer and integrating the different functional disciplines throughout a product life cycle. Ideally, "seamless management" will produce an optimum balance of cost-schedule-performance trade-offs over the entire product life span.

Recent research on the implementation of IWSM and IPD found that the degree and pace of implementation varies among different organizations. Overall, development of "seamless processes" and organizations is being achieved. However, barriers have inhibited implementation in some organizations. In general, differences between the acquisition and sustainment functional organizations, now unified in one organization and one command, persist to varying degrees and inhibited implementation efforts.

Further evaluation of the how AFMC organizations operationalize "seamless processes" affects the processes of transition and consignment is warranted. The way each organization operationalizes "seamless processes" will determine, in part, how it

interacts with functionally different and geographically separate elements in its own organizations, and with similar units in separate single manager organizations. The key issues incorporated into IWSM Plans and CONOPS, and into transition and consignment MOAs may define the extent and protocol of these intra- and inter-organizational relationships. Consequently, the management approach and practices delineated in organizational plans, instructions, and agreements affect how the "seam" between acquisition and sustainment is fused.

III. Methodology

CHAPTER OVERVIEW

"Seamless" is a central concept in the IWSM philosophy. "Seamless"

organizations" and "seamless processes" are managed by a single manager

throughout a product's life cycle. The single manager delineates intra- and inter-

organization authority and responsibility relationships that affect the processes of

product management. Relationships between individuals, teams, and functional

offices, within an organization and between organizations, affect the manner in which

the processes of product management are executed. In other words, the relationships

and interaction between different elements of product management organizations

demonstrates the way the "seamless" nature of IWSM is operationalized.

Using a case study approach, this research identified and evaluated how

different AFMC organizations operationalize the IWSM concept of "seamless

processes," with regard to the processes involved in shifting product management

authority and responsibility from acquisition to sustainment units. One goal was to

learn how four AFMC single manager organizations integrated acquisition and

sustainment processes, and how separate single manager organizations allocated

authority and responsibility within their own organizations and between other single

manager organizations.

The following issues are discussed in this chapter: the relevance and derivation

of the research question, reasons for using a case study approach, the population and

sample, the data collection plan and instrument, conduct of the interviews, data

analysis, and limitations of the study.

RESEARCH QUESTION

The research question is "How does the way selected AFMC organizations operationalize the IWSM concept of 'seamless processes' affect the shifting of the 'center of gravity' of product management from acquisition to sustainment units?" Several definitions are required to explain this approach. First, the word "operationalize," in this context, may be defined as the methods or means for executing the IWSM philosophy. That is, how is IWSM put into action? More formally, "operationalize" refers to a description or definition that is stated in terms of specific testing criteria or operations (11:28). Second, IWSM is defined in the IWSM Guide as a "management philosophy for acquiring, evolving, and sustaining our products. It empowers a single manager with authority over the widest ranges of decisions and resources to satisfy customer requirements throughout the life cycle of the product" (4:9). Third, "seamless processes," a central concept in IWSM, are grounded in a management system that focuses on products and supporting processes at all organizational levels (4). "Seamless processes" involve a single management system that relates requirements, planning, resource allocation, execution, and program tracking over the total life cycle. A single manager provides a single point of authority and responsibility, and focuses product management efforts on satisfying customer needs. Fourth, the concept of "center of gravity" has different meanings based upon an individual's interpretation. The "center of gravity" may be viewed from the overall system or from a subsystem perspective. In general, the concept refers to the location of the single manager and the predominant process ongoing in product management. In theory, the program director (an SPD, PGM, or MGM) is located at the developing or

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the sustaining organization. Location of the single manager depends on which process, e.g., development, production, modification, or sustainment, is the predominant focus of program management. However, the single manager may not be located at the Center where the majority of the product management effort is performed. This is especially applicable when the "center of gravity" is based on the status of different subsystems. In some cases it is possible to have "centers of gravity" for subsystems that differ from the "center of gravity" for the overall system. Additionally, shifting the "center of gravity" is an arbitrary decision, and does not necessarily occur in conjunction with the process of transferring product management responsibility.
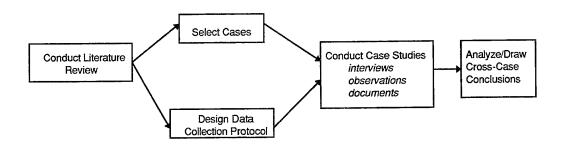
CASE STUDY APPROACH

The case study approach was used because this research attempted to answer "how" and "why" questions, the researcher has little control over events being studied, and the "focus is on contemporary phenomenon within some real-life context" (25:13). Additionally, a case study is appropriate to use when "emphasis on full analysis of a limited number of events or conditions and their interrelations" is desired (11: 85). Case studies provide a means to gain data, directly from the subject matter experts, to describe the interrelationships between processes and elements in an organization (25).

The case study approach used in this research examined "seamless processes" in several different organizations. Although several organizations were examined as individual cases, "embedded cases," i.e., evaluation of sub-cases within a larger case, were useful to gathering data (25:49). This design facilitated answering the research

question in two ways. First, based on information in the Literature Review, it was assumed that the way AFMC organizations operationalize the IWSM concept of "seamless processes" would be different in each organization. Second, also based on the information on PMRT noted in the Literature Review, it was assumed that for any system or sub-system the processes of transition or consignment would be executed incrementally, not at one point in time. Therefore, it is possible that discrete elements of larger programs are transitioned or consigned separately. Evaluating these incremental efforts constituted sub-cases within a larger case.

Where the samples involved "embedded cases," the data gathered from these cases was analyzed as if it were a "holistic" case study (25). That is, although the cases were discrete units of analysis, the data gathered from each was analyzed together, not separately. Evaluating and identifying similarities in the operationalization of "seamless processes" among the cases produced a "global" description and an answer to the research question. Figure 3 is a simple diagram of this case study process adapted from Yin (25).

FIGURE 3. CASE STUDY PROCESS (25)

POPULATION AND SAMPLE

The population of interest included all AFMC organizations that directly perform product management and that have implemented the IWSM philosophy. This involved SPD, PGM, and MGM organizations. As noted earlier, the case studies included whole systems involving the entire product organization, or subsystems. Therefore, the organizations in the population (and sample) varied in terms of product cost, phase of the product life cycle, and diversity of organization.

The sample product organizations or programs, in the instance of embedded cases, should be at the life cycle phase in which product management responsibility will soon be or recently has been transferred within the single manager organization or from one single manager organization to another. Organizations that have implemented IWSM, planned and executed a transfer of product authority and responsibility and/or a shift in the single manager organization "center of gravity" provided data to answer the research question.

A key factor in selecting an organization was the relationship between the Product Center organizations, e.g., the development SPO or DSO, and the Logistics Center organization, e.g. a System Support Manager in the same product organization or a PGM or an MGM in different organizations. The operationalization of IWSM should define the relationship between different organizations and affect the planning and execution of any transfer of authority and responsibility.

Four product organizations were involved in this case study. Within these organizations there were "embedded cases," such as subsystem upgrades. This resulted in six separate cases. In addition, these six cases had different organizational "centers of gravity." That is, the focus of the program and the location of the single

manager were divided between Product Centers and ALCs. This better represents the population of AFMC product organizations.

Finally, selection of interviewees depended on involvement with the processes of consignment or transition. However, an ideal interviewee was assumed to have five or more years of experience in acquisition and/or sustainment management, with involvement in management responsibility transfer processes both before and after the implementation of IWSM. Lack of previous experiences with responsibility transfer processes, however, did not obviate the usefulness of gathering data from an individual.

DATA COLLECTION PLAN

The operationalization of IWSM is unique in every different organization. There is a common set of guiding principles, e.g., the eight tenets, but the application of IWSM is controlled by each single manager. Similarly, the process of transferring authority and responsibility from one organization to another is unique in every instance. Each instance is a potential case study in itself. Accordingly, gathering data requires direct discussion with those individuals responsible for planning and executing transfer or consignment processes. The data gathered describes each organization's experience in realizing a transfer of authority and responsibility, and, possibly, a shift of the organization's "center of gravity." Therefore, personal interviews using structured, formal, open response questions were used to collect data on these processes. Organizational directives and instructions, policy letters, and inter-organizational memoranda of agreement were also sources of data.

DATA COLLECTION INSTRUMENT

An interview protocol (Appendix B) was developed to elicit data to answer the research question. The interview questions focused on three key issues affecting the operationalization of IWSM. First, the meaning, use, and effect of IWSM on the respondent's organization and his or her job were addressed. Second, a description of the "seamless processes" with regard to intra- and inter-organizational interaction affecting authority and responsibility relationships was sought. Third, a description of the processes of transition and consignment, with regard to authority and responsibility relationships, was elicited.

The interview protocol was developed from archival research conducted during preparation of the Literature Review. The interview questions are based on a "sense" of the IWSM philosophy derived from review of AFMC, the Centers, and product organization policy literature. Additionally, information obtained through review of numerous organizational surveys and process effectiveness reviews focused the questions on current issues affecting the realization of "seamless processes" in different AFMC organizations.

Detailed question wording is critical to eliciting the proper responses. There are four key issues that affect question development (11). Of primary importance is that the questions be stated in terms of shared vocabulary between the interviewer and the interviewee (11). Also, the questions should be clear, brief, and unambiguous. Care should be taken to assure that there are no un-stated or misleading assumptions in the questions. Finally, biased wording, e.g. name dropping or using superlatives, should be eliminated. Additionally, the questions should be personalized to reduce abstraction

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and externalization of issues. Obtaining the respondent's expert opinion and understanding is essential to adequately answering the research question.

To refine the interview instrument, two pilot interviews were conducted. The original questionnaire containing 15 questions was reduced to 11 questions to alleviate redundancy and to better focus the interviewees on the concept of "seamless processes."

CONDUCTING INTERVIEWS

In-person and telephone interviews were used to collect data in these case studies. Personal interviews afforded the greatest flexibility because the interviewer may react to the interviewee's body language (11). This may provide insight into the whether the interviewee understands the question. Consequently the interviewer may be better able to alleviate confusion over question wording or intent. In general, it is hoped that two-way communication will preclude or resolve any problems with understanding the interview question. Of course, in-person interviews were ideal, however, time and financial constraints limit the extent that in-person interviews were possible. Telephone interviews were conducted when in-person interviews were not possible. For both in-person and telephone interviews, attempts to provide a copy of the interview protocol to the respondent prior to the interview were made. These attempt were successful in 10 of 19 instances. Although providing the questions in advance may have eliminated some spontaneity and resulted in somewhat "canned" responses, it was unclear whether it affected the conciseness and depth of responses.

Promoting the respondent's receptivity and willingness to participate is a critical task of the interviewer. Emory notes that a respondent's receptivity depends on the

respondent's perception of the purpose of the interview (11). That is, do the respondents perceive any benefit from their participation? Additionally, willingness to participate is also affected by the respondent's understanding of how the data gathered will be used. These two points were directly addressed in a purpose statement and disclosure statement in the interview protocol (Appendix B). Emory states that respondents "often react more to their relationship with the interviewer than to the content of the questions" (11:296). Finally, it is essential that the conduct of the interviews enhances data collection efforts and yields data that will adequately answer the research questions.

DATA ANALYSIS

The purpose of this research was to gather data from product organizations to describe how "seamless processes" are operationalized in organizations in which IWSM has been implemented. Accordingly, the data gathered was evaluated at face value. Data analysis involved categorizing and correlating similar and dissimilar policies and procedures of different AFMC organizations. Also, similarities and differences with the erstwhile PMRT process were addressed. As noted earlier, individual case studies were not analyzed separately; instead the data gathered in each case was compiled and compared with the data gathered in other cases. This "holistic" approach was suited for identifying similarities and differences, or trends in the processes of transition and consignment in the case study organizations.

Limitations. There were several limitations to this case study research. First, the generalizability of the data analysis and conclusions was limited by the nature of "seamless processes" under IWSM. In particular, the processes of transition and

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consignment, like many other aspects of IWSM organizations, are unique to each product organization. Clearly there is no one correct way to perform these and other product management processes. Second, elimination of biases and achieving consistency in interviewing posed problems that may have contributed to differing results. To the greatest extent possible, a consistent and objective approach to each interview was employed. Third, there were bound to be differences in the data gathered from in-person versus telephone interviews. Every effort was made to eliminate these differences.

CHAPTER SUMMARY

A case study approach was used in this research. Managers involved in planning and executing "seamless processes" were the target response group in this research. Using open-ended questions allowed for a relatively unconstrained flow of information. The interview questionnaire was designed to move from general to specific questions. The questions attempted to gather data about managers' opinions of IWSM, "seamless processes," and to learn how the processes of transition and consignment were performed. The objective of the questions was to gather data of sufficient quality and relevance to answer the research question. Furthermore, every attempt was made to accurately represent both product center and air logistics center perspectives. However, this goal was affected by the varying quality and completeness of the interviews.

Data gathered was compared and integrated for analysis. In the Findings and Analysis section, answers to each interview question were evaluated in the aggregate. Representative responses were presented to show the full spectrum of opinions.

IV. Findings and Analysis

CHAPTER OVERVIEW

The efforts of four organizations implementing IWSM and creating "seamless processes" were examined in this case study research. The findings are based on interviews with 19 managers involved in 6 separate case studies. In addition to the interview data, organizations' IWSM plans, transition and consignment plans and instructions, and memoranda of agreement were reviewed. Attainment of "seamless processes" is affected systematically by individuals, organizational constraints, and product management constraints. In this section, data gathered during the interviews is objectively presented. Any causal explanations of individual or organizational behavior are based on the respondents comments.

The chapter is divided into three sections: Data Collection, Interview Findings, and a Summary. In the Data Collection section the case study organizations and sample respondents are described. In the Interview Findings, the answers to the eleven-question interview protocol (Appendix B) are documented and analyzed. Finally, the Summary emphasizes the key issues discussed in the chapter.

DATA COLLECTION

As noted in the Methodology, the actual selection of interviewees was determined by contacting organizations involved in transition or consignment processes. Four SPOs were contacted to identify which products, or if the whole system, were involved in the transition or consignment processes. In the four SPOs in

this case study, there were two major systems and one subsystem transition in-progress, as well as three commodity consignments efforts. All the acquisition activities were conducted at the Aeronautical Systems Center (ASC) at Wright-Patterson AFB, and the logistical sustainment efforts were performed at Oklahoma City, Ogden, San Antonio, and Warner-Robins Logistics Centers.

The Case Study Organizations. In this research, the case study organizations are not specifically identified. The data is analyzed through a "cross-case" method The purpose is to gain an understanding of the trends in how IWSM is perceived and implemented, and how this affects "seamless processes" in the case study organizations. The findings represent the consensus response to questions. However, unique findings are included when they demonstrate the diversity of opinions and applications of IWSM.

The four organizations involved in the case study are described in Table 2 There were actually six case studies, since there were two "embedded cases" in two of the organizations.

In terms of demographic data, the existence of several different life cycle phases on a system was not anticipated. Respondents noted that they were involved in both Production and Deployment, and Operations and Support life cycle phases. All four of the organizations involved were managing operational systems that were being supported by ALC activities, and, in one case, by interim contractor support. The existence of multiple life cycle phases was based on the modification of subsystems or subsequent reprocurement of weapon systems. Managers viewed phases from the product perspective, not based on the whole system.

TABLE 2. CASE STUDY ORGANIZATIONS

Case Organizations	Case Studies	Type of Single Manager	Location of Interviewees
Aircraft System A	1. Support Equipment 2. Major Sub-system	SPD (located at PC)	Four at PC Two at lead ALC
Aircraft System B	1. Support Equipment 2. Major Sub-system	SPD (located at ALC)	Four at PC One at lead ALC One at supporting ALC
Aircraft System C	Whole System	SPD (located at ALC)	Two at PC One at lead ALC
Aircraft Sub-system D	Whole Sub-system (treated as an End Item)	PGM (located at ALC)	Two at PC One at lead ALC

Sample. Nineteen people were interviewed. The interviewees may be categorized as follows: 5 of 19 were military; there was one civilian contractor; 13 of 19 were stationed at ASC; 11 were logisticians, 3 were program managers, 5 were engineers. The levels of experience in weapon system management varied from 1 year to 27 years, with an average of 13 years. The grades of military people ranged from second lieutenant to major, and grades for civilians ranged from GS-12 to GS-14. Six people were in program manager positions even though it was not their primary functional specialty. Every interviewee was assigned to an IPT, although many had duties in addition to those tasks assigned through their IPT. Additionally, there were five interviewees with both acquisition and sustainment experience, ranging from 8 to 19 years of total management experience. These individuals met the "ideal interviewee" criteria stated in the Methodology. There were also two people who previously worked with PMRT policy issues on the Acquisition Logistics Division staff. Fourteen interviews were conducted in-person, and five were via telephone.

Conducting the Interviews. An eleven-question interview protocol (Appendix B) was used to elicit data from the interviewees. Although attempts were made to transmit the protocol to the interviewees in advance of the interview, only 10 of 19 respondents received and reviewed the protocol before the actual interview. Also, there were three impromptu interviews. That is, the introduction and interview were conducted simultaneously without prior notification. The differences in prior knowledge or media used, i.e., in-person versus via telephone, appeared to impact the quality, conciseness, or level of detail of data gathered during the interview. In-person interviews were more complete, easier to manage, and lasted longer. There was at least one question that was not answered satisfactorily in each interview. This was due to ineffective conduct of the interviews or to the interviewee's lack of experience with the issues. Consequently, some interviews were more productive than others.

In addition to interviews, numerous IWSM plans, transition and consignment plans and operating instructions (OI), status reports, and memoranda of agreement (MOA) were collected to explain not only transition and consignment processes, but also the organizations' concept of "seamless processes."

INTERVIEW QUESTION FINDINGS

Overview. As noted in the Methodology, the interview protocol questions were arranged from general to specific. The first three questions ask about the IWSM philosophy, the next three questions ask about the IWSM concepts of "seamless processes" and organizational "center of gravity," and the remaining five questions ask about the processes of transition and consignment. In the remainder of this section the question and paraphrased answers are documented. Quotes are used when the

interviewees exact words are used. The data was sanitized by eliminating specific weapon system names and locations. The individual organizations or programs from which the data was gathered are not identified because there is no intent to compare one organization to another. Instead, similar and dissimilar experiences of the organizations in the case studies are documented in an attempt to describe IWSM and "seamless processes" as viewed by the managers interviewed. An earnest effort was made to present opposing views and a full spectrum of responses.

Question 1. "When you think of IWSM, what comes first to your mind?" Most respondents did not have difficulty in answering this broad question. Responses to this question sometimes answered other questions in the protocol. Almost all respondents answered in terms of the effect implementing IWSM had on the relationship between Product Centers (PC) and Air Logistics Centers (ALC).

According to the respondents, IWSM means "integration" of PCs and ALCs. Several managers claimed that there is a " big difference in the relationship between" the PC and the ALC in our single manager (SM) organizations, however outside the SM organization, "nothing has really changed." For example, one individual noted that the "ALC hasn't really embraced the IWSM philosophy and IPT structure." Additionally, IWSM resulted in "better communication, but there's still parochial and political factors" that affect PC and ALC interaction. Several managers noted that there has been "no big change between PC and ALC, we already had a good rapport." While others stated that the "old stand-off between the ALC and the PC still exists, there is an 'us' and 'them' attitude." In this same vein, one individual stated that IWSM is "lip service since there's really no team" between the PC and the ALC. The development SPO organization "is in the driver's seat." Many decisions that affect the product are short

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term and are based on what the PC wants. "The fallacy of IWSM is that it's not really cradle-to-grave. It may appear that way because it's on an organizational chart, but the reality is there's a significant difference" between the PC and ALC portions of our organization.

Prior to implementing IWSM the PC and ALC were "in opposition at all times because there were two commands." However, the concepts of a single manager and a single face to the user integrated these formerly separate parts of these organizations. According to one manager, IWSM means "flexibility," the SM organization has the ability to be "innovative." It's not as rigidly bound as it was under the two command structure.

In addition to "cultural" differences between PC and ALC parts of organizations, many respondents noted that "personal attitudes are key." For IWSM to be successfully implemented the "biggest hurdle," which is "human attitudes," must be overcome. More than one respondent stated that the philosophy espoused in IWSM requires a "personal commitment, it must be embraced." Additionally, one respondent claimed that "people make IWSM work, not policy or broad philosophical goals." Focus on individual behavior as the key to achieving IWSM organizations and "seamless processes" was a key input gathered in the interviews.

Question 2. "Has the implementation of IWSM affected your organization? If so, how?" All respondents noted that implementing IWSM produced changes in their organizations. Many noted that changes were in the form of organizational design and form. There were two prominent changes. First, creating a single command and single weapon system organizations eliminated "formal barriers" between PC and ALC organizations since one organization manages both acquisition and sustainment

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activities. Second, implementing the integrated product team (IPT) structure reoriented the way teams are operated. However, many interviewees did not believe that organizational structural changes alone produced changes in performing weapon system management processes. Consistently, the interviewees noted that individuals in leadership positions made the difference by enabling achievement of the benefits available due to structural changes. That is, if the managers from IPT leader through the SPD embraced IWSM, then real change was possible. Success of integrated processes was easy to undermine if there was a manager, who had not embraced IWSM, in the authority and responsibility management loop.

One manifestation of eliminating the "formal barriers" between the acquiring and sustaining organization was increased communication and coordination between PC and ALC organizations. Overall, the most common answer to question two was that there was "lots more communication" between PCs and ALCs, both in the same weapon system organization and between separate organizations. As noted in previous studies of IWSM implementation, increased telephone communication and TDY were the most common means, followed by increased use of electronic communications media such as electronic mail and video teleconferencing. However, of those interviewees who noted there was more communication and coordination, they also stated that there was a marked difference between the effectiveness of intra-organizational versus inter-organizational communication. Being on the same team with the same boss, e.g., the Single Manager, enhanced communication. Additionally, many people responded that changes under IWSM increased the number of people they coordinate with on management issues. This may be attributed to the fact that PC and ALCs no longer work in isolation, and there are earnest attempts to involve ALC

personnel "from early on" in weapon system management decisions. Some interviewees stated one caution, however. That is, increased communication and coordination does not necessarily produce more effective processes. On the contrary, some individuals were frustrated by the requirements to increase communication and coordination, which they claimed resulted in less efficient processes.

In addition to increased PC to ALC coordination and interaction, individuals in three of the four organizations in the case study noted that improved customer support resulted from implementing IWSM. For example, one individual at an ALC noted that "the IWSM concept has produced a closer tie to the SPO, and this has enabled better response to the customer...." Part of this improved responsiveness to customers stems from increased communication between the PC and ALC elements of the weapon system organization to ensure that the "right" people were involved in solving problems.

Similar to the agreement among respondents in citing increases in PC and ALC communication, most respondents stated that there were two problems with regard to integrated product teams (IPT). First, prior to IWSM there was too much focus on functional office goals, i.e., the "vertical stovepipe" mentality resulted in focusing on tasks that were most important to the functional office, not on tasks supporting the project/product. This myopic perspective was attributed to the fact that, even though individuals were assigned to projects, they were controlled and reported through functional chains of command. IPTs were designed to change the focus from functional concerns to product requirements. This was to be achieved through permanently assigning individuals to specific IPTs and realigning both the management and performance reporting chains with the IPT structure. This has occurred in most of the organizations in the case study, and, as noted above, all of the individuals

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interviewed are assigned to IPTs. However, according to many respondents, the stovepipe focus has shifted from the functional office to the IPT. That is, individuals on IPTs have insufficient interaction with other individuals in their specialty. This results in unequal assignment of workload among individuals in the same specialty. One individual noted that the lack of a central controlling function, i.e., a functional office, also results in an inability to set priorities among products and taskings competing for a worker's time. Consequently, individuals are left on their own to decide the priority of tasks to be accomplished.

Another criticism of IPTs is that the lack of interaction between people in the same specialty all but precludes opportunities to learn from one another and reduces standardization of practices (which, according to IPT proponents, is a positive effect of forming IPTs because it enables innovation). Most of the managers interviewed noted concern over reduced interaction among functionals. Their concern was that with the draw-down in civilian personnel and the constant rotation of military members, certain tasks that were previously monitored by the functional office, would "fall through a gap" and be overlooked. This deficiency, they claimed, occurred because there was only one person in a given specialty assigned and responsible for those functionally specific tasks on a particular IPT.

Another concern involved product-based "vertical stovepipes." Rather than excess functional orientation, certain managers noted that IPTs may become too focused on the product and do not interface with other IPTs which are affected by their actions. One example involved a line replaceable unit (LRU) modification in which management was delegated to sub-IPTs for software, hardware, and support equipment (SE). There was no overall integrating management function, and each IPT

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worked in its area of responsibility, in isolation from other IPTs. The end result was a product that could not be installed in an aircraft because the SE IPT was not informed of hardware changes requiring technical order changes and new installation tools.

One additional criticism of the IPT structure was the confusion it created over lines of management authority and reporting chains. This finding is consistent with findings from previous studies.

Question 3. "Has IWSM changed the way you perform your job? If so, how?" Only 3 of the 19 people interviewed indicated that the "way" they perform their jobs has changed. The managers interviewed indicated that the "processes" they are involved in have not changed substantially. The informal chain of command and means of communication remained relatively unchanged. However, the formal organizational structure, i.e., the creation of IPTs, has changed some aspects of the "way" at least three of the respondents perform their jobs. For example, increased multi-functional interaction and the elimination of a "stigma" attached to certain specialties has improved the processes. A Sustainment IPT Leader from an ALC stated that his job was totally different due to his close involvement with the Development System Organization (DSO). In fact, he noted that the "us" and "them" situation had diminished significantly, and that he had "more influence" and received "more support" from the DSO than he received from his parent unit (a PGM) at the ALC. Another change that was favored and despised almost equally, was the cross flow of specialists into positions other than their primary specialty. For example, several engineers and acquisition logisticians were in program manager positions.

In support of the pre-IWSM organizational structure, one senior manager from an ALC noted that the restructuring into one SPO has "taken away the ability to

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document problems" and to use the former ALC chain of command as leverage in dealing with the PC organization. The implication is that, in at least one instance, the SPD favored the PC position and this manager had no means to re-address the "problem." Another manager noted a similar situation. He claimed that under the "old system" lines of authority and responsibility were clearer, both within the development SPO, and between the SPO and the ALC, "because you could easily identify whose buy-in [approval] you had to get." Although many other respondents did not note a specific change in the "way" they performed their jobs, many did note that increased communication among different "functionals" and between the PC and ALC organizations has affected their jobs.

Question 4. "What does the IWSM concept of "seamless processes" mean in your organization?" "Seamless Processes" were defined in the interview protocol as a central concept in IWSM. They are grounded in a framework that relates products and processes at all organizational levels. "Seamless processes" involve a single management system that relates requirements, planning, resource allocation, execution, and program tracking over the total life cycle. A single manager provides a single point of authority and responsibility, and focuses product management efforts on satisfying customer needs. Most managers interviewed interpreted this question with regard to divisions between PCs and ALCs, although the "seam" could also apply to functional boundaries. A common reply was "IWSM has reduced the 'seams' between the geographically separated elements of the SPO, but a 'seam' still exists." Another manager noted that "it's always been 'us' and 'them,' and the single manager concept hasn't totally fixed that." In general, the concept of "seamless processes" was nebulous. One manager noted that "I've never understood what is intended by

'seamless processes.'" Increased communication and coordination between PC and ALC elements of a SPO were the most obvious aids to reducing "seams." Additionally, there were many joint PC and ALC IPTs, which typically involved the identification of a specific point of contact for certain functional tasks at either location.

With regard to a functional "seam," one manager noted that there were distinct functional "seams" in her organization. For example, "functionals on the IPTs still primarily perform only functional duties, and, generally, do not offer any assistance in other areas." In addition, there were no Contracting or Finance personnel assigned to the IPT, although individuals from these offices were assigned to work certain projects. This resulted in the "functionals' allegiance going through the functional chain, their [the functional workers] reporting goes through that chain, and the work they perform is controlled by the functional office." More than one manager noted that "rice bowl" mentalities and a lack of "ownership in the product" among functionals was detrimental to team cohesion.

Despite examples of functional "seams," several managers presented cases of inter-organizational cooperation that mitigated "seams." Two examples illustrate differences of opinion and experience on inter-organizational cooperation. First, one ALC manager described interaction between the PC and the ALC, and between functionals in his organization's "seamless processes" as follows:

> As the program flows from production and deployment into sustainment we've seen the program cross the traditional boundaries at which the program would usually PMRT. Although we question 'where are we headed?' and there's been a lot of confusion...there's always been a flow of communication and a willingness to address the issues.

The second, example involves a Sustainment sub-IPT, which consists of both DSO and ALC personnel, that supports an end item managed by the DSO and used by

two different aircraft systems. The PC manager noted that this arrangement "helps manage engineering changes to ensure that the necessary support equipment, technical orders (T.O.), training, etc., are available. The goal is to ensure that implementing an [engineering change proposal] ECP doesn't adversely affect the users." In a different organization a manager stated:

> The line between development and sustainment is not well defined, so basically, projects are assigned [between the PC and the ALC] based on manpower and other managerial factors. The ALC is doing things that should be here [at the PC] and we're doing things that should be out there.

In most organizations, the SPD decides how to structure workload throughout the whole organization. The preceding examples described similar ad hoc divisions of workload supporting a single product. However, the opinion of the manager about the merit of this arrangement in the latter case is diametrically opposed to the opinions of the two managers in the former case. This may be based on the nature of the work that is performed by the PC versus the ALC. In the former example, the DSO did not have the expertise to perform the logistics and support tasks that were performed by the Sustainment sub-IPT at the ALC. In the latter case, the Program Manager, an engineer, was referring to engineering work that was tasked to the PC SPO even though the ALC assumed management responsibility for the product in the late 1980s.

Individuals' attitudes are critical in determining the extent to which "seamless processes" are achieved. One logistics manager stated:

> ...when 'seamless processes' work, they're fine, but there's few of them. People are the determinant of the effectiveness of the 'seamlessness' [of processes]. There are still the same 'mind-sets' at the worker level [i.e., "us" and "them"], [which]will only be overcome by time.

In concert with this perspective, another senior manager noted that "seamlessness" will be achieved but it will take a "cultural" or "generational" transformation.

Question 5. "What is the scope and amount of interaction with geographically separate units *within* your single manager organization?" This question proved to be redundant since it was frequently answered by the replies to earlier questions. In general, the "interaction" varied in both scope and amount based on the different tasks and functional specialties available at different locations. For example, provisioning is typically performed by ALC personnel. Consequently, when provisioning tasks were involved, ALC logisticians performed these duties. This involved increased communication and coordination, mentioned previously, to integrate provisioning with other system management activities. Additionally, the scope and amount of interaction was not seen as any different under IWSM than prior to implementing IWSM. One explanation is similar to the rationale and attitudes expressed in answering Question 3. That is, the nature of the tasks performed has not substantially changed.

The interviews revealed two channels of communication between the developing SPO and sustaining ALC organizations. In some instances, the program managers, engineers, logisticians, and others at the PC communicated directly with individuals involved with product management issues both within the SPD organization at an ALC and with PGM and MGM organizations. In two cases, the developing SPO organization coordinated solely with its own ALC organization; in turn, the ALC managers coordinated with other ALCs providing subsystem sustainment. This second method was thought to minimize the "cultural" differences, summarized by one manager who stated that "words mean different things [to PC and ALC people], and we have different backgrounds and perspectives on how to do business." This idea was supported by the comments of a PGM manager who noted that communication between his organization and the sustaining ALC side of an aircraft SPO was "free

flowing, because we're both flying [supporting], not buying." In comparison, the same manager stated that communication with the developing side of the SPO was "not as good." Accordingly, ALC to ALC communication was seen as one means to resolve the "communication problem."

In an ironic statement about differences between "functionals," one logistics manager commented that she experienced more effective communication with logisticians at different ALCs than she did with people in different functional specialties within her PC organization. In general, IWSM resulted in increased communication and coordination between functions, and between PCs and ALCs. However, *increased* communication and coordination is not synonymous with *improved* communication and coordination. Examples of both situations were obtained from the interviews.

Question 6. "Does the concept of an organizational "center of gravity" apply to your organization? " "Center of gravity" was defined in the interview protocol as the location of the single manager. That is, whether the System Program Director is located at the developing or the sustaining organization. Location of the single manager depends on which process, e.g., development, production, modification, or sustainment, is the predominant focus of program management. This explanation was consistent with the understanding held by many of the respondents. However, it appears to be over-simplified, since it focuses on the location of the SPD as being synonymous with the "center of gravity." This concept is applicable when describing a major system program, such as an aircraft. But this understanding fails to recognize that the aircraft consists of subsystems which may be at different phases of the product life cycle, and, therefore, have different processes dominating program management activity. For example, one of the case studies involved a subsystem that was managed

by a DSO at the PC, while the SPD was located at the sustaining prime ALC. For this specific subsystem, the majority of program management activities were in the process of shifting from development and production to sustainment. In other words, the "center of gravity" for the subsystem was in the production and deployment phase, whereas the "center of gravity" for the whole weapon system, as defined by the location of the SPD, was in the sustainment phase.

In another case study involving the transition of a major weapon system, the system was managed by an IPT at the DSO location, while the SPD was located at the sustaining ALC. This occurred because the SPD had the authority and responsibility for weapon system management of a "basket SPO," in which several major weapon systems were grouped as a "mission area," i.e., based on similar mission. In this case, the system DSO and the Program Manager (the IPT Leader) at the PC were delegated authority for controlling the budget and resources, as well as cost-schedule-performance management, while the SPD retained overall responsibility. Similar to the case study noted in the previous paragraph, this case study involves a "center of gravity" that is distinctly separate from one based solely on location of the SPD.

Based on the preceding discussion, most of the managers interviewed explained the location of the "center of gravity" in terms of their specific program, which was either an actual system or subsystem. In practical terms, the location of the SPD may affect which group of managers, either at the PC or ALC, enjoy leverage or delegation due to propinquity and "line-of-sight" tasking from the SPD. Separation from the SPD may also create a situation in which managers perceive that they must "please two bosses." For example, one program manager noted that she must satisfy

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both the DSO and the SPD, which led to conflicting guidance on more than one occasion.

This factor highlights a point made by many managers when answering Question 1, but applicable to the concept of "center of gravity." The implementation of IWSM and the actualization of "seamless processes" is greatly affected by individuals in leadership positions. One manager claimed that the "biggest hurdle [in implementing IWSM] is human attitudes." Moreover, "people make IWSM work, not policy or broad philosophical goals."

Although most respondents were clear in defining the "center of gravity" as the location of the SPD or where the majority of work and funds were being spent on a particular program, there were two managers on different programs who stated the "center of gravity" was "blurred." One ALC manager stated that "we've transitioned to the sustainment phase of the program, [and] I would almost have to say that we don't have a 'center of gravity.' It's kind-of equally balanced between the ALC and the SPO.... The program is at a point where we could not sever the SPO and survive." The key idea in this statement is although the majority of activity and dollars spent were for sustainment, there were critical tasks still performed by the DSO. Moreover, in this case, the "center of gravity" of program management had shifted to the ALC, but formal transfer of product management authority and responsibility had not yet occurred. Therefore, the location of the "center of gravity" is not necessarily the same location of the organization managing the product.

Question 7. "How does your organization implement the process of "transition" (i.e. workload transfer)?" This question was intended to elicit an organizational or personal definition of the process of transition. Question 9 is intended to gather data

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about how the process is performed, i.e., implemented. The process of transition, or workload transfer, was explained in the interview protocol as a shift in the "center of gravity" from the PC to the lead ALC (see Appendix B). The SPD position of a major system is relocated to the sustaining ALC because the focus shifted from developing and producing to sustaining an operational system. Transition occurs within the same product organization. It involves relocating the position of authority and responsibility, the single manager, from the PC to the SSM (lead ALC) location. As noted in the answers to Question 6, the respondents did not equate the location of the "center of gravity" with the location of the single manager or the process of transition. The Protocol explanation was also limited since it did not conceive of a transition from a DSO to an SPD or PGM already located at an ALC. The deficiencies of this preliminary explanation did not cause problems in obtaining answers to the question.

In the organizations involved in this case study, transition is called "lead change," "internal consignment," "relocation," and "internal workload transfer." In the transition process, product management authority and responsibility is formally transferred from the developing organization to the sustaining organization, which are both are within the same single manager organization. Transition applies to the whole weapon system or to subsystems. Transition occurs at two levels. First, for major systems that are out of production, with the majority of activity in sustaining the system, and whose SPD has not moved the PC to the ALC, transition means "relocating" the SPD and formally transferring product management responsibility and authority from developing organizations to sustaining organizations. Second, transition may apply to a subsystem, regardless of the location of the SPD. For example, in two of the case studies, the SPDs were located at the PC, but management authority and

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responsibility for individual products was formally transferred to the System Support

Organization (SSO) at the ALC.

One manager noted that

> ...under IWSM I think the ideal is that you don't even realize that you've
> transitioned and that's happened [in this SPO]. We haven't formally
> documented that, so it's like we're backing up, going to a more formal process,
> [which is] similar to what we had when we were separate commands...
> Regardless of what you call it, you still have to do the same things in transition.
> You can say that...you're not doing a PMRT, but you're doing it. By formalizing
> it, it seems to work better because it makes it easier to deal with the concerns
> we both have [both PC and ALC]. We need to identify up-front what it is we're
> trying to do. We must know what specifically is required to transfer management
> responsibility.

This quote typifies many of the characterizations of the process of transition.

Question 8. "How does your organization implement the process of

"consignment"?" Similar to the preceding question, this question was intended to

obtain an organizational or personal definition of the process of consignment.

Consignment was also defined in the interview protocol. The process of consignment

occurs when a product, i.e. a subsystem or component, is developed and produced by

one single manager organization, e.g., the SPD, and the responsibility for sustainment

is shifted to another single manager, e.g., a Product Group or Material Group

organization. Responsibility for system management remains with the SPD throughout

the life of the system. Authority and responsibility for subsystem management is

shared between the two Single Managers (SPD and PGM or MGM), and the SPD

performs oversight of product management for consigned subsystems. The term

"consignment" was unfamiliar to many of the managers interviewed. However, the

concept embodied by the term was not unfamiliar. Consignment was referred to by the

same name in several organizations and as "external consignment." An acquisition

logistician, who is also the consignment coordinator for his DSO, offered one of the

best explanations of consignment:

> Consignment is the term used for any management responsibility transfer. It's a subjective decision of the product program managers. As the work load shifts in nature from acquisition to sustainment type activities, for which the development portion of the SPO doesn't have expertise, the IPT leader [i.e., program manager] coordinates with the appropriate IPT leader [i.e., equipment or item manager, or an engineer] at the ALC to negotiate the issues and the timing of product management responsibility transfer.

In this explanation, there is no difference noted between consignment and transition.

This concept was also used by another SPO which defined consignment in an

operating instruction (OI) as: "The orderly, timely, and efficient transition of

management responsibility of subsystems/equipment from a single manager to the next

appropriate management level in the IWSM Single Manager Model" (13:2). The model

in this reference depicts the "Single Manager" and the "next appropriate management

level" as the Development and Production Center of Excellence[7] (COE) and /or the

DSM, or the Sustainment COE or the SSM (4). In this discussion, the term transition

will be used to explicitly differentiate between transferring product management

authority and responsibility within a single manager organization. Conversely,

transferring product management authority and responsibility between separate single

manager organizations, is referred to as consignment. Despite this difference, there

were only minor differences between the two processes in practical application in the

case studies. These differences will be noted in the discussion in the next question.

Question 9. "How does your organization perform the processes of transition or

consignment?" The purpose in asking this question was two-fold. First, to gain an

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[7] A COE is defined in AFMCP 800-60 as a "Command designated pool of experienced people who are available for the single manager to draw upon for either development or sustainment. COEs may be established at either" PCs and/or ALCs, and are the source of DSM, SSM, staff, and IPT members depending on the single manager's needs (4:48).

understanding of the nuts and bolts of the process used to transfer product management authority and responsibility. Second, to tie together the issues discussed earlier in the broader questions on IWSM, "seamless processes," and organizational "center of gravity." Ideally, evaluation of these processes would demonstrate the effectiveness of interaction between different functional specialties and between different organizations.

Most of the individuals interviewed did not recognize a significant difference between transition or consignment. The fundamental purpose of both processes is the same: to formally transfer product management authority and responsibility from one organization to another. As indicated earlier, transition involves a transfer within the same overall organization, while consignment involves transfer between two separate single manager organizations. Despite this difference, many managers saw the processes as the same because the end result is that one organization reduces its workload and responsibility for a particular product, and another organization assumes more workload and responsibility. According to this perception, four managers, from both PC and ALC organizations, noted that the gaining organization has no incentive to accept more work. Additionally, several respondents noted that it was a "SPO problem," i.e., SPO at the PC. This is particularly true when managers are faced with declining resources due to budgetary cut-backs. Addressing this point, one manager stated that there is

> ...no real difference between transition or consignment. Politics are a significant determinant of when and what gets transferred. In the era of draw-downs, transferring work from one organization to another creates problems unless there is flexibility in assigning manpower at the gaining organization. However, if the gaining organization does not have the manpower positions available to give, then there will be significant inertia pulling against accepting the additional workload.

This quote applies to some situations, but not all.

In all of the case studies, both the PC and ALC personnel were simultaneously performing product management tasks. In fact, in some instances the majority of tasks were performed by the sustaining organization, but the authority and responsibility had not been formally transferred. In these cases, manning was less an issue than product-specific status. One manager noted that the fundamental point in the transition or consignment process is "it's still as hard as it ever was to get another organization to accept total management responsibility."

On the other hand, there are instances when transfer of product management responsibility was pursued by the sustaining organization. Two examples were mentioned during the interviews. One involving a line replaceable unit (LRU) and another involving a support equipment item in which the ALC organizations wanted to obtain product management authority and responsibility, especially engineering authority, to consolidate management for the whole system. This consolidation would enable better management of configuration control, and streamline product management by co-locating the ALC product management function and the periodic maintenance function at one location.

Clearly a significant difference between the consignment and transition processes is the source of approval authority. Transition occurs within one single manager organization. Therefore, the SPD has the final authority to determine delegation of product management authority, responsibility, and workload. Obviously, in a consignment, the transfer of product management authority, responsibility, and workload occurs between two, or more, separate single manager organizations. This creates a situation in which there are two separate single managers with authority for

product management. That is, the major system SPD is responsible to the user for overall system cost, schedule, and performance. But authority for a subsystem is transferred to a separate organization. This does not end the involvement of the major system SPD. One consignment OI states that following transfer of product management authority and responsibility to an PGM or MGM organization, "an avenue exists for the PGM/MGM organization to receive technical and management support from the SPD organization. 'Consignment' establishes a partnership between the SPO organization and the PGM/MGM organizations" (13:2).

Maintaining a single face to the user requires extensive and frequent communication and coordination between the SPD and PGM organizations. This includes back-channel information when the user(s) work directly with the office that is actually managing system elements. In one case study, there was a triangular information network incorporating the SPD, PGM, and the prime contractor. Although earnest communication efforts were made at the manager-level in both the SPD and PGM organizations, one party was sometimes left out of the coordination loop. To eliminate gaps in information flow, the prime contractor coordinated with both organizations on important issues affecting both system and subsystem configuration and performance. For example, engineering change proposals (ECP) and actions were sent to both SPD and PGM organizations without regard for which one initiated the ECP.

The preceding example highlights the appeal process available to product managers. Simply stated the appeal process refers to using the chain of command. The creation of AFMC and single manager organizations provided a structure to resolve differences between PC and ALC organizations at the lowest level. Consignment and

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transition often involve difficult issues that require senior manager involvement to resolve. In the case of a transition, many of these issues can be resolved by a single manager. In the case of consignment, if difficult issues cannot be resolved at the working level single manager-to-single manager relationships, e.g., SPD to PGM or MGM, higher level involvement may be required. The respective Designated Acquisition Commanders, i.e., Center Commanders, may become involved if single managers cannot resolves conflicts. Managers interviewed in the case studies said this appeal process helps minimize intransigence.

Without exception, interviewees indicated that both transition and consignment processes were based on subjective negotiating and decision-making, and "horse trading." This is not to imply that there is no systematic evaluation of the status of systems; there is. However, there was no quantitative heuristic employed by any organization in the six different case study examples.

Question 9 a. "How is planning conducted? Who is involved?" Planning typically involves functionals from IPTs or responsible offices interacting in their respective area of expertise to define requirements needed to execute transfer of authority, responsibility, and workload. Planning at this level may be through a transition/consignment IPT, which may be independent or associated with the Depot Maintenance Activation Working Group (DMAWG). It is important to point out that transition/consignment and depot activation are two distinctly separate processes, although the outcomes are interrelated. The DMAWG is concerned with obtaining support equipment, T.O.s, resources and industrial capacity necessary to perform depot-level periodic maintenance on a product. The transition/consignment team is concerned with the ability of the sustaining organization to provide program

management for the product during its operational phase. This involves defining program management issues (e.g., design stability, engineering authority, configuration management, status of contracts and funding, integrated logistics support) and "entry/exit criteria" that will determine when a system will transfer. Different "sides of the house" at an ALC perform these sustainment processes. In fact, sustainment product management and depot maintenance are not always performed at the same ALC. Regardless of where these functions are performed, the issues affecting both transition/consignment and DMA are interrelated and should not be performed in isolation.

All four organizations involved in the case studies developed OIs or transition/consignment plans. In some cases these plans were broad guidance. Also, several organizational plans contained templates and checklists identifying "maturity indicators." Used in this sense, a "maturity indicator" may be defined as a measure of a product's development and its point in the life-cycle as an indicator of readiness to transition/consign to the sustaining organization" (13).

Planning groups varied in size, composition, and leadership. In some instances the groups consisted of "functionals" representing different program management specialties. Naturally, individual involvement varied. For example, once the contracting issues are resolved, the contracting officer's involvement decreases. Often times group membership was on an ad hoc basis. As noted earlier, the PC product manager usually initiated and managed transition/consignment planning. However, in one case study the planning group was a sub-IPT of the DMAWG and was co-chaired by managers from the sustaining ALC and the developing PC. In another organization, subsystem and support equipment managers from all five ALCs were identified as

members of a "Commodity Class Consignment Process Management Team (PMT)." The PMT members at the ALCs also act as liaisons for the major system SPO when the system was affected by internal ALC affairs. For example, this sometime involves coordinating with depot maintenance planners and supervisors on customer support concerns to assist the SPO in providing a single face to the user.

Product program managers determine when planning should begin. Ideally, this planning should occur "up-front," i.e., sometime during the Production and Deployment Phase after the design is stable and the system is operational. However, there is no specific milestone or event-related trigger that indicates it is time to plan for product management transfer. Based on the interviews, initiating planning in a subjective decision.

Question 9 b. "What are the major issues addressed? How are these issues determined?" The major issues addressed are either product-specific or involve resources, such as manpower and funding. There are two types of product-specific issues: broad management issues affecting authority and responsibility for product management functions, and more narrow status of specific product management tasks. One manager summed up the transition/consignment issues succinctly: "the status of maturity indicators and stability of the system, status of contracts [what type of money is available to fund the contract], ECPs, and modifications" affect the transfer of product management authority and responsibility. The issues are determined by the managers involved in the transition/consignment process.

Four key management issues were identified in the interviews. First, the level of overall system stability desired prior to transitioning/consigning a product is a primary concern in all cases. Interviews identified three factors that are evaluated to determine

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system stability: maturity indicators; product unique indicators such as system reliability and maintainability, e.g., the number of in-flight failures of a system; and the professional opinion of senior managers. System stability was characterized by two extremes. For example, one PC manager stated that "if it's not stable, they [ALC] won't take it." Conversely, in another case the PC management was unwilling to transfer a product because the reliability was unstable and additional modifications were likely to be required.

Second, the question of *how* the system will be transferred is a key issue. As one manager noted, the system must be broken down from a "huge, unmanageable glob" into discrete elements that can be transitioned with as few incomplete processes as possible. In three of the four organizations in the case study, systems were transitioned/consigned "incrementally." That is, the system was divided into its subsystems, and each subsystem was divided into its major components, such as line replaceable units (LRU) or shop replaceable units (SRU). For example, one of the embedded case studies involved an aircraft subsystem which consisted of five LRUs. When the program managers for each of the LRUs determined that the applicable maturity indicators satisfied target levels, the whole subsystem would be transitioned. Incremental transfer is designed to avoid splitting configuration control, to consolidate contracts as much as possible, and to produce clear and logical breaks in product management.

Third, delegation of engineering authority is a critical management issue. Several managers stated that engineering authority was the most critical issue in the transition/consignment process. In fact, one senior logistician stated that "the biggest key is, where does engineering responsibility lie?" Several managers implied that

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possession of engineering authority is the *sine qua non* in the transition/consignment issue. The first goal is to logically break the system down for incremental transfer, but ongoing modifications and upgrades on one subsystem usually affect the stability of other subsystems. For example, a software modification on an avionics subsystem dictates a corresponding modification to organizational and intermediate level tester and other support equipment. This interdependence confounds the decision of how to allocate engineering authority. Organizations use dollar value, extent of the modification, or location of expertise as benchmarks to determine how to allocate engineering authority. Any decision on this issue is contestable because both PC and ALCs have engineers who are capable of interfacing with contractor engineers and managing engineering change proposals (ECP) and other issues. Consequently, concerns over distribution of workload and utilization of assigned personnel, i.e., "is there more work for these people if we transfer their jobs?," affects the decision to transfer engineering authority and work.

Fourth, is the question of "residual tasks." Several managers noted that "residual" was a "bad word" because it was used in the PMRT process. Regardless, disposition of tasks which are managed by the developing SPO and in-progress when the transition/consignment occurs must be addressed. In the case studies, this issue was decided with respect for constraints such as: what was the best allocation of manpower and financial resources, where was the expertise to perform the required tasks, and what affect would reassigning these incomplete tasks have on system stability and configuration management? Some mangers implied that "rice bowl" issues affected decisions on residual taskings. However, there was no specific evidence in the case studies to support this contention.

In addition to management issues affecting transition and consignment, more narrow product-specific issues act as key benchmarks for determining a system's readiness to transfer. These "maturity indicators" apply to different products in varying degrees. Two of the case study organizations used planning templates as tools to identify and monitor the status of applicable indicators. Table 3 lists the "maturity indicators" that managers analyze when determining if a product is ready for transition or consignment. "Maturity indicators" and the management issues already discussed are interrelated and interdependent. There is no hierarchy of importance among the issues identified in the "maturity indicators." The issues that are not resolved receive the most management attention and emphasis.

As noted earlier, transition and consignment are initiated by the developing PC organization. However, executing transition/consignment is at the discretion of both the PC and ALC organizations involved. Interviewees expressed an attitude that transition/consignment were PC "problems," and it is in the best interest of the gaining organization to ensure that the status of the maturity indicators and other pertinent factors are acceptable.

Referring to Table 3, two indicators that usually do not present problems in the transition/consignment process are provisioning and depot support contracting. These two functions are typically performed by ALC personnel with limited involvement from PC managers. Conversely, reprocurement data and the issue of engineering authority, discussed above, are the two most troublesome factors. Reprocurement data includes drawings and other data in sufficient enough detail to enable a new manufacturer to produce a product, e.g., system, subsystem, or component such as an LRU.

TABLE 3. TRANSITION/CONSIGNMENT "MATURITY INDICATORS" (13)

• Has provisioning been accomplished? If not, when will it be accomplished?
• Have T.O.s been contracted? If not, provide status.
• Has Organizational and Intermediate level support equipment (SE) been fielded? If not, identify and provide status.
• Have Functional and Physical Configuration Audits been completed? If not, identify estimated completion date.
• Has reprocurement data been contracted? If not, give estimated contract award date.
• Are there outstanding Preliminary Quality Deficiency Reports (PQDR)? If so, provide the anticipated closure date of the final PQDR.
• Are there outstanding engineering change proposals (ECP) to correct deficiencies? If so, document on the Record of Outstanding ECPs and provide contract award date.
• Is the depot support contracted? If not, give the estimated contract award date.
• Are integration risks from known related developments low? If not, identify the impacts and estimated completion date of the effort.

Interviewees indicate that reprocurement data is the most divisive issue in efforts to transition/consign a product. In all six case studies, the reprocurement data was a significant issue. Drawings are required for the ALCs to maintain technical orders (TO), and to find alternate sources of manufacturing for parts. A typical scenario involves the purchase of a lower level drawing[8] that is incomplete for the purpose of reprocurement bidding. In other words, prospective alternate sources of manufacture are not able to re-produce a product based on the level of detail included in the drawing. This results in the need to re-acquire more complete drawings, if available. This requires funds, and this point is usually the issue of contention, i.e., who will pay for the proper drawings? Even *within* single manager organizations, this issue causes significant contention between PC and ALC organizations.

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[8] Engineering Drawings are purchased in three levels: Level I is basically a sketch, Level II is a top-down view of the item's structure without specific part characteristics, and Level III is a blueprint type drawing that shows all parts and denotes the specific characteristic of the parts. For example, amperage in a fuse or electrical/electronic parameters of a capacitor, diode, or whole circuit card. Certain information on Level III drawings may be proprietary, and not releasable by the manufacturer.

In addition to focusing on "maturity indicators," managers in two organizations used somewhat different approaches. First, in one case study the product specific issues were similar to the "maturity indicator" already mentioned. However, the focus on the issues and the development of the transition plan was oriented from a functional perspective. That is, the plan was divided into functional areas, such as logistics, contracting, and configuration control. Within these functional areas the appropriate "maturity indicators" were identified and evaluated. Second, another organization used broad guidance on where to allocate authority and responsibility based on a decision matrix in addition to identifying and evaluating "maturity indicators." This decision matrix assesses the status of eight factors and recommends where to allocate authority and responsibility. For example, if a product has a "mature" design, there are few contract changes, the Air Force is performing maintenance actions and contractor interim or logistics support is not involved, etc., then a Logistics Center may be the appropriate organization to perform product management. This matrix is broad guidance, and the particular circumstances affecting each product must be evaluating to determine whether a Product or Logistics Center is the appropriate organization for performing product management. Table 4 shows the matrix.

Despite variations on the issues, most managers indicated that when pre-defined target levels of "maturity indicators" were met and broader management issues are resolved transition/consignment will occur. However, several ALC managers indicated that they had little leverage or ability to prevent a transfer of responsibility. These ALC managers noted that when the PC was ready to transition/consign a product they would "dump" product management on the ALC. The data gathered in the case studies showed that transition/consignment occurred based on some level of

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negotiation between the PC and ALC, and that compromises between each organization lead to conclusion of an agreement. One ALC manager noted that, although production decisions still drive many aspect of product management, the PC and ALC are on more equal footing under IWSM. Another PC manager noted that "politics are a significant determinant of when and what gets transferred." According to this manager the process is a "horse trade."
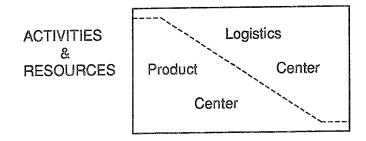
TABLE 4. PRODUCT MANAGEMENT ALLOCATION DECISION FACTORS (4:50)

FACTORS AFFECTING ALLOCATION DECISION	LOGISTICS CENTER Allocate to an ALC when status matches	PRODUCT CENTER Allocate to a PC when status matches
Design Stability	Mature/Low Risk	Not Mature/Med-High Risk
Contracting Activity # of Contract Changes # of Contracts	 Few Many	 Many Few
Program Funding Development (36) Production (30) Support(34)	 For Retrofit For Supporting Modification Repair/Inspection	 For Product/Retrofit For System/Major Mod. N/A
Customer Requirement	Support Field System	Long-term Development
Customer Relationship Stability	Established/Deployed	Evolving/Not Deployed
Organic Maintenance Capability	Mature	Under Evaluation/Immature
Type of Expertise	Modification Engineering/Support	High Risk Development and Engineering
Commodity (subsystem)	Separate Management (PGM/MGM)	Subsystem with Developmental Challenges

NOTE: The status of all the factors must be evaluated in the aggregate to determine the proper location for product management.

Question 9 c. "How does your organization decide when (if) transition or consignment will occur?" There is no generic baseline or event-driven timing for transition/consignment to occur, except when designated by the organizations involved. Likewise there is no regulation requiring management responsibility transfer to occur within six months prior to or after the completion of production, as there was with the PMRT process (10). In every case in this study, transition and consignment occurred

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when predetermined status of indicators was achieved and senior managers agreed to the transfer, not necessarily at a particular milestone or event. In another sense, one manager stated that as the "pendulum" of workload shifts from acquisition tasks to sustainment tasks, the development SPO works itself out of a job. This idea of *when* to move relates to the notion that when the resources at the development SPO can be better used on new programs, the PC will initiate transfer. The decision to transfer has many variables that are both internal and external to the SPO. Timing of transfer is not simply a function of product maturity, but is also affected by SPO and the Center's demands for resources, e.g., manpower and funds.

Figure 4 depicts the idea of the shifting focus from acquisition to sustainment tasks as system maturity is achieved. Demand for and consumption of resources shifts from acquisition activities to sustainment activities as products are fielded, full sustainment capabilities are achieved, and system safety, reliability, and maintainability measures meet stabilization targets. Note that resource utilization at either the PC or the Logistics Center never reaches zero. This implies cradle-to-grave and inter-organizational involvement of the acquiring and sustaining single managers throughout the life of a product. This figure applies to both transition and consignment processes.

ACTIVITIES & RESOURCES

Product Center

Logistics Center

TIME (System Life Cycle)

FIGURE 4.   SHIFTING THE "CENTER OF GRAVITY" AND WORKLOAD

Question 9 d and e. "What is the product of transition or consignment?," "How are the decisions and outcomes of these processes documented?" Although these two questions were asked separately, the answers were usually the same. In fact, question 9.d. could be eliminated. There is no specific "product of transition or consignment" except for a documented agreement. As already noted, all four organizations in the case study had either transition/consignment OIs or plans. Each of these documents included templates or lists of issues to be evaluated and documented in a memorandum of agreement (MOA) between PC and ALC organizations. Authority to approve these agreements was delegated to the lowest appropriate level. In the case of a subsystem transition, the "three letter" managers such as the DSO, SSM, or even senior Program Managers in charge of system-level IPTs were delegated approval authority. In the case of a subsystem consignment, the agreement approval authority was exercised by the appropriate single managers, e.g., an SPD and a PGM or MGM.

Two of the case study organizations produced MOA based on templates in their OIs. "Terms and Conditions" in the MOA defined the authority and responsibility relationships between the consigning organization and the consignee. In a sense, this is a product of the process. Table 5 contains example "Terms and Conditions" from one of the case study organizations.

Transition/consignment agreements culminate a process that frequently takes years of negotiating, and occurs after the system is operational and being maintained by depot facilities. For example, these case studies involved systems and subsystems that were fielded up to four years ago. However, circumstances, such as interim contractor support or system configuration instability, inhibited transfer of product

management responsibility. Once transition/consignment is formalized with an

agreement, the sustaining product manager notifies all users and associated

manufacturers.

TABLE 5. CONSIGNMENT "TERMS AND CONDITIONS" (13:A3)

o   The consignee at the ALC assumes total responsibility for all product/materiel management activities not specifically assigned to the SPO. This includes the Configuration Control Board authority to make engineering changes, with SPD review and coordination.
o   Initiator of change to a subsystem/equipment assumes total responsibility for the change and for changes to other subsystem/equipment affected by the change, regardless of whether the SPO or consignee has management responsibility of the subsystem/equipment.
o   SPO will continue to provide management and technical assistance to consignee upon request on a case-by-case basis.
o   SPO will retain responsibility for procurement of production and peculiar SE requirements to satisfy initial issue. Table of allowance increases are the responsibility of the SPO only when driven by a new system/product/materiel development by the SPO.
o   Consignment is effective upon signature by the SPD and the PGM or MGM. The gaining organization will notify the customer of the consignment action.

Disposition of MOAs varied in the case studies. In some cases, the MOA

became appendices to a transition plan. In other cases, MOA were filed in the SPO

Consignment Manager's desk. None of the case study organizations systematically

documented or maintained a database of MOAs that could be used to determine what

subsystems or components had previously been transferred. Several managers noted

that this was a deficiency and resulted in extra hours of research.

In the PMRT process, the finalized PMRT Plans, when finalized, were used to

update the system Program Management Directive (PMD). This documented what

items were transferred, and was required for funds allocation. In the case study

organizations, the transition/consignment agreements do not affect the PMD. One

reason for this was the way funds are allocated under IWSM. Because a SPD

manages a product from cradle-to-grave, it remains engaged by requesting funds from

the using commands to perform both acquisition and sustainment activities. There is no complete disengagement of PC organizations upon initiation of ALC responsibility.

Question 10. "Following transition or consignment, how is your organization involved in product management?" This question is answered in the applicable transition or consignment MOAs. The broad management issues discussed in question 9 b. provide answers. In the most basic sense, the ALC organization is formally authorized and responsible for product management. However, unlike under the PMRT process, the developing SPO is not totally divorced from the product. This is true even in the case of a consignment. Many PC managers stated that they remain involved in product management to ensure integration of design and engineering changes, especially in the case when a PGM or MGM organization has engineering authority for a subsystem or component. In this instance, communication is critical to ensure integration between the separate organizations managing the major system and its subsystems.

Interviewees expressed different opinions over the role of the development SPO following a transition/consignment. As noted above, several PC managers indicated that they remained involved in certain aspects of product management. This involvement included more than the "residual" tasks identified in the transition/consignment MOA. PC managers noted that because the system SPD has cradle-to-grave responsibility they would remain involved in system or subsystem modifications or upgrades. Additionally, they remained involved based on direction from the SPD. Contrary to this perspective, many ALC managers in both SPD and PGM organizations stated that ALC organizations assumed total authority and responsibility for the system or subsystem following transition/consignment. However,

they also noted that a PGM organization is responsible to notify the system SPD organization of engineering changes or other issues affecting the consigned product and the parent system.

This raises the issue of authority between SPDs and PGMs. It is clear that an SPD retains authority and responsibility throughout the life of a system. However, as indicated by the inputs from the manager-level interviews, the equality or hierarchy of authority between SPDs and PGMs is nebulous. For instance, a PGM is a single manager with authority and responsibility for product management of common subsystems. This position is charged with presenting a single face to the users and providing cradle-to-grave management for subsystems. Similarly, an SPD is charged with single face to the user and cradle-to-grave management for the entire system. To whom does a user direct questions? The managers interviewed indicated that users used both channels to communicate. This is another situation that requires effective communication between SPD and PGM/MGM organizations.

In an attempt to clarify this issue HQ AFMC/DR posted the following information via "PDINFONET" messages:

> Unlike the old PMRT process when the SPO dissolved at the end of development/production, the new IWSM SPO will remain, providing cradle-to-grave support for the system. In reading the following, keep in mind that transfer of management responsibility is between single managers. This process is not limited to SPD consignment. Consignment may occur between the SPD and the PGM/MGM, or the PGM and MGM.... There are occasions when it is appropriate to move responsibility for a subsystem/component/or supporting equipment item of a system/product to another single manager. This process is consignment. Once consigned, the gaining single manager assumes full responsibility for that component.... The bottom line is - Consignment does not separate acquisition from sustainment. (15)

Several managers noted another significant change based on the idea that consignment does not "separate acquisition from sustainment." That is, the possibility

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of a "reverse" transfer of responsibility. This involves a situation in which product management responsibility was previously transferred, ostensibly from a PC to an ALC, and was returned to the PC to perform specific tasks. Based on the case study data, this type of "reverse" transfer occurs within SPD organizations, not between an SPD and PGM or MGM organization. This makes sense since the SPD has authority to allocate workload between the PC and ALC elements in the same organization. This is an example of "seamless organizations" that would not have been possible under the PMRT process.

Question 11. "Does your organization use any metrics to measure the processes and products of transition and consignment?" Two of the four case study organizations used metrics. One organization used a metric to evaluate the process of transition/consignment. This metric measured the length of time it took to complete the process from planning to signing an MOA. This metric provided information on the in-progress time for ongoing transition/consignment processes. For example, there was no greater detail than the fact that since initiating the process, organization "X" had taken 150 days to process the paperwork. There was no specific example of an application of this metric that affected the processes of transition/consignment.

Another organization used metrics to measure the system stability in terms of "safety, reliability, and maintainability." This metric, for instance, evaluated the number of in-flight failures of a subsystem. A target ratio of the number of failures per flying hour was set and functioned as a "maturity indicator." Other similar indicators included the number and frequency of ECP receipts. In this case, the metric was used as a benchmark for managers to monitor system stability. When the predetermined level was reached, one indicator of "readiness" to transfer was satisfied.

CHAPTER SUMMARY

Six case studies were conducted in four AFMC SPO organizations. These case studies involved 19 interviews with mid-level managers at both product centers and air logistics centers. An eleven question interview protocol was used to elicit data. The protocol questioned respondents about IWSM, "seamless processes," and the processes of transition and consignment.

Question answers were compared and integrated to present a complete perspective on the issues covered. There were three common themes in the findings. First, successful IWSM implementation requires "personal commitment" to the tenets of the philosophy. Managers in the chain of product authority and responsibility must facilitate an IWSM environment for "seamless processes" to be achieved. Second, effective, constant communication between geographically separated elements of the same single manager organization or between different single manager organizations is essential to achieving "seamless processes." Third, the processes of transition and consignment present difficult issues that demonstrate the level of seamlessness in IWSM organizations. Both product-specific and managerial considerations affect these processes. "Up-front" planning and effective communication between PC and ALC organizations are critical activities that will enhance these processes. System stability, the availability of the proper engineering technical data, and resource concerns are three key issues affecting transition and consignment.

Data gathered in the interviews was analyzed and used to develop conclusions related to the research question, "How does the way selected AFMC organizations operationalize the IWSM concept of 'seamless processes' affect the shifting of the

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'center of gravity' of product management from acquisition to sustainment units?" In the next chapter the case study findings and an answer to this question are presented.

V. Results and Conclusions

CHAPTER OVERVIEW

In this chapter information presented in the Literature Review and the Findings and Analysis chapters is integrated and evaluated. Specifically, this chapter focuses on three issues. First, the differences between the PMRT process and the IWSM processes of transition and consignment are evaluated. Second, a discussion and comparison of the findings from previous research and findings in this research on the product management organizational environment are presented. Third, with respect to the first two issues presented, an answer to the research question is developed.

PMRT AND THE IWSM PROCESSES OF TRANSITION AND CONSIGNMENT

There are significant differences between the PMRT environment and the IWSM environment. Organizational changes are the most pervasive and obvious. A single manager, in a single command, manages both acquisition and sustainment activities throughout the life cycle of a product. One case study organization succinctly summarized the contrasts between PMRT and the IWSM environments. Table 6 shows the comparison.

Similar to the differences noted in Table 6, the case study findings indicated two differences between PMRT and the IWSM processes of transition/consignment. These differences are: cradle-to-grave management and the possibility of reverse transfer, and allocation and control of funds. Each difference is discussed below.

First, the single manager organization has cradle-to-grave responsibility for products. As one case organization's IWSM Plan stipulated,

The SPD is responsible and accountable for decisions and resources in the overall execution of...programs. Within the program direction and funding, the SPD establishes budget priorities, plans expenditures, and determines executability of program direction. The SPD is the single face to the user for all...aircraft...programs through the complete life cycle from cradle-to-grave. (20:ii)

TABLE 6. RESPONSIBILITY TRANSFER: TRANSITION/CONSIGNMENT VERSUS PMRT (14)

TRANSITION/CONSIGNMENT	PMRT
1. SPD has cradle-to-grave responsibility	1. Transfer to ALC then dissolve SPO
Continued involvement with PGMs and MGMs	'Line-in-the-Sand' Philosophy
MOA between single managers (SPDs and PGMs/MGMs)	'Contract' between commands, AFSC and AFLC
SPD is responsible for system acquisition and sustainment	SPO focus on acquisition, ALC focus on support
2. Management Transfer with SPD Oversight	2. Complete Management Transfer
SPD provides assistance if required	Not reversible
Partnership is maintained via joint IPTs	No ties between SPO and ALC
System Support Manager (SPM) reports to SPD	System Support Manager worked for ALC
3. Transfer based on system/subsystem maturity and resource availability	3. Transfer of mature systems based on milestones
4. Designated single manager for products with life cycle management	4. No overall single manager
5. Single face to the customer - single managers share responsibility for subsystems	5. Multiple faces to user (e.g., SPM, Item Managers)

Cradle-to-grave management entails continued PC involvement in products even after program management authority and responsibility is transferred to an ALC. Managers at PCs noted that they remain involved not only through the completion of "residual" tasks, but as needed "on a case-by-case basis." A single manager has the authority to allocate workload to whichever organization is best qualified and has resources to perform the work.

The SPD's retention of authority for a system provides product management continuity and enables another significant change. That is, the ability to "reverse

transfer" product responsibility and workload from a sustaining organization to a developing organization. This aspect of single manager authority affords "flexibility," which is seen as a positive outcome of IWSM by some managers. Other managers noted that "flexibility" also creates confusion. For example, one manager characterized consignment as "a good philosophy, but in day-to-day life we're not sure what it means. It's more ominous than PMRT, when the other agency had it totally. Now they [the ALC] got it for day-to-day management, but if anything unforeseen comes up they can send it back to the SPO." There was one example of a "reverse transfer" in the case studies. The transfer occurred, ostensibly, because the expertise to manage a subsystem modification was located at the PC.

Although the SPD is "responsible and accountable" for product management from cradle-to-grave, the SPD's authority may be delegated to subordinate managers. This type of delegation illustrates changes under IWSM when it involves delegation between geographically-separated elements of a single manager organization. In one case study organization, an SPD, located at an ALC, delegated "...special authority for specific acquisitions and programs..." to the DSO, who was located at the PC (20:3). "Examples of such authority are chairmanship for acquisition [configuration control boards] CCBs, approval of acquisition strategy/plans, business clearance approval, and undefinitized contractual actions for the management of assigned programs" (20:3). This is another example of "flexibility" and integrated product management possible under IWSM. Under the former two-command structure and PMRT, this would not have been possible.

In addition to cradle-to-grave management, sources and control of funds are different under IWSM. One manager stated that a "significant difference between

PMRT and transition, is that the user allocates money annually to the single manager" under the IWSM process. The single manager allocates funds within his/her organization based on the division of workload and the category of funds. Moreover, an SPD remains involved in the programming and allocating of funds even after product responsibility is transitioned or consigned. This involvement does not include depot product "maintenance" activities, but it does include program management activities at ALCs. Additionally, this applies to both SPO development system or system support organizations, and to completely separate single manager organizations, i.e., PGMs and MGMs, that provide product management for subsystems. In both cases the SPD requests funds (including development, production, operations and maintenance, and sustainment funds) from the using commands. In the case of consigned subsystems, the PGM or MGM informs the parent system SPDs of their share of the sustainment costs. The SPDs, in turn, include this cost into their own system's budget. In addition to the funds the SPD receives from its customers, there are other sources of money that flow from the Air Staff and other agencies to the Center commanders, and to acquisition and sustainment organizations. Funding is a complex issue and suffice it to note that the "seam" between acquisition and sustainment may be mitigated by the authority granted to an SPD.

Despite tangible evidence of the differences between PMRT and the IWSM processes of transition and consignment, many managers do not perceive differences. As noted in the Findings and Analysis chapter, many managers noted that IWSM has not significantly changed the fundamental process involved in performing their jobs. This perception applies to the mechanics of the transition and consignment processes also. For example, one interviewee noted that "the consignment philosophy is basically

the same thing as PMRT. [It is] the same process of verifying that all of the information required to be supportable in another agency is there, and they'll accept it."

FINDINGS ON THE SYSTEM MANAGEMENT ORGANIZATIONAL ENVIRONMENT

In addition to a review of the PMRT process, five factors affecting IWSM implementation noted in previous research were discussed in Chapter II. The previous researchers found that differences between the acquiring and sustaining organizations affected the realization of "seamless processes." Specifically, cultural differences between the PC and the ALC, parochialism, "PMRT mind-set," divided authority and personnel performance rating chains, and the importance of communications, are findings that specifically affect the seamlessness of IWSM processes and organizations (7; 8; 23). In this section, previous and current findings are discussed.

There were three common themes in the findings in this case study research. First, successful IWSM implementation requires "personal commitment" to the tenets of the philosophy. Managers with product authority and responsibility must facilitate an IWSM environment for "seamless processes" to be achieved. Second, effective communication between geographically separated elements of the same single manager organization or between different single manager organizations is essential to achieving "seamless processes." Third, the processes of transition and consignment present difficult issues that demonstrate the level of seamlessness in IWSM organizations. Both product-specific and managerial considerations affect these processes.

In this case study research there were no findings that contradict findings noted in previous research and documented in the Literature Review. In fact, the emphasis

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interviewees placed on the need for effective communication between different "functionals" and geographically separated organizations in these case studies was consistent with findings from previous research. Likewise, interviewees provided examples of "PMRT mind-set" and parochialism, as well as organizational structures that confounded authority relationships. As noted in the Findings and Analysis chapter, however, both positive and negative examples were presented.

The findings on the system management organizational environment indicate that three elements have a significant impact on an organization. These elements, which are significant in any organizational system, are: the individual, the nature of work, and the organizational structure.

The Individual as an Element in the Organizational System. An individual as leader, manager, or worker is a key element in an IWSM organization. As noted in the Findings and Analysis chapter, one manager stated that individuals must "embrace" or "make a personal commitment" to IWSM to successfully implement the philosophy. Obviously, each individual is an element in an organizational system. Therefore, each individual affects transformation processes ongoing in those systems. IWSM is doomed to failure if "individual" elements in the system are in competition and working against each other rather than developing synergy.

With regard to the impact of individuals, there were two case examples involving transition of subsystems that have been halted by individuals. Both cases were similar. In one case, managers at the PC noted that changes in personnel at ALCs prevented transition of subsystems that were "ready," i.e., the "maturity indicators" met the criteria for transition to occur. On the contrary, the "new" ALC manager claimed that this subsystem transition was delayed because the system was not "ready" according to his

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criteria. Ostensibly, the previous ALC manager had worked out the details to the transition with the PC managers, and these details were unsatisfactory to the "new" ALC manager.

The Nature of Work as an Element in the Organizational System. Individuals, of course, do not exist or work in isolation. People are affected by organizational culture and climate. Some outcomes of organizational culture and climate, noted in this and other case study research on IWSM, are parochialism, functional or product stovepipe attitudes, and "PMRT mind-sets." These outcomes are based, in part, on the differences in the nature of work performed by different "functionals," and PCs or ALCs. In this use, the "nature of work" is an element in the organizational system. Differing nature of work produces different objectives, priorities, and methodologies, e.g., "we have different backgrounds and perspectives on how to do business." These types of differences, create (or perpetuate) "seams" when they result in competition between groups. Conversely, differences in the nature of work can be mitigated and "seamless processes" can be created when the individuals involved not only communicate, but gain an understanding of what causes those differences. This is an important point. There is nothing in the IWSM philosophy that advocates elimination of differences between "functionals," or between PCs and ALCs. Accordingly, facilitating "seamless processes" requires identifying those differences, determining which ones act as constraints, and eliminating constraints to developing product-focused "seamless processes."

With regard to differences between "functionals," the eight core processes of IWSM are, in broad terms, equivalent to the different functional specialties involved in product management processes. Functional specialization is necessary due to the

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complexity of tasks involved in product management. However, IWSM, through the IPT structure and product-focus, attempts to minimize parochial, "stovepipe" attitudes by increasing multi-functional interaction and using cross-flow assignments (as noted in several of the cases in this research). However, in some instances variations in organizational structure produce effects contrary to IWSM goals. These are discussed in the next section.

This research focused on the "seam" between PCs and ALCs. Similar to the justifiable differences between "functionals," the different nature of work between acquisition and sustainment organizations is needed. In addition to the differences between "functionals," the individuals involved in product management also need to understand, or at least be aware of, the unique objectives of acquisition or sustainment activities. This issue was addressed by Abrams (1). He noted that the single manger organizational structure was designed to integrate "functionals" performing different activities in unified processes supporting a product throughout its life cycle. Additionally, he noted that there are distinctions between acquisition and sustainment activities. These distinctions are documented in Table 7.

Differences in mission and the nature of work between PCs and ALCs are reinforced by geographic separation. However, as noted in several case studies, increased communication and interaction with the goal of understanding each others' requirements mitigate these inherent differences. Additionally, "up-front" planning and involving sustaining organizations in key facets of product development and production may increase "buy-in." This is easier said than done, however.

Acquisition of engineering drawings provides an instructive example. This issue was noted in each of the six case studies. The problem, invariably, involves purchase

of a level of drawing that was inadequate to support reprocurement or finding an

additional source of manufacture.

TABLE 7. DISTINCTIONS BETWEEN ACQUISITION AND SUSTAINMENT
ACTIVITIES (1:18.12)

Acquisition Activities
○ Initial weapon system or commodity development and procurement
○ Permanent modifications
○ Initial spares and support equipment
Sustainment Activities
○ Safety of flight and air worthiness activities, such as aircraft structural integrity program, system safety groups, and mishap investigations
○ Readiness and sustainability assessment, including control of mission capability impacting parts shortfalls and critical item programs
○ Maintenance support, including response to field problems and requests for assistance as well as over all maintenance requirements reviews
○ Replenishment spares and support equipment management, including requirements definition, buy, and repair
○ Modification requirements generating from product improvement working groups, maintenance data analysis, and material or quality deficiency report
○ Non-developmental equipment acquisition
○ System retirement and usable asset reclamation

In some instances, ALC managers were involved in the decision to purchase

certain types of drawings, in others they were not. Regardless of who was involved,

there were situations in which the "correct" level of drawing was not procured.

Managers noted that this may have been due to trade-off decisions that favored other,

shorter term cost-schedule-performance factors. Furthermore, engineering drawings

for reprocurement were an abstraction at that phase of the system life cycle. However,

when the system or subsystem was ready for transition or consignment, "correct"

engineering drawings were not available. The real issue in this example may stem from

differences in mission, but is grounded in how funds are allocated. A single manager

has control, or at least significant impact on how funds are allocated to effectively support products throughout the life cycle.

Organizational Structure as an Element in the Organizational System. A single manager is charged with designing an organizational system that provides the proper environment and hierarchy of objectives to deliver a product that satisfies the customers' needs. An axiom of IWSM is to focus on the product, then the process, then the organizational structure (4). Organizational structure involves the arrangement of people and delineation of authority and responsibility relationships. Recognizing that there are inherent differences in the missions and the nature of work between "functionals," and PCs and ALCs, a single manager should develop an organizational structure that takes advantage of these differences by fostering multi-functional and multi-Center interaction throughout a product life cycle. Single managers in the four case study organizations created organizations with various structures, ostensibly to best support product management. Despite differences, all the case study organizational structures included elements of functional, matrix, and IPT structures.

Similar to the differences between functional specialties or missions of PCs and ALCs, having a hybrid organizational structure is neither good nor bad. That is, an organizational structure that supports accomplishment of the processes that deliver the "right" product is "good." However, developing a hybrid structure results in the presence of the advantages and disadvantages of each type of structure involved in the mix. This was noted in the interview findings.

Managers stated contradictory opinions about the hybrid structures in the case study organizations. For example, several managers stated that individuals on IPTs still only perform their functional specialties. Additionally, individuals on IPTs

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commented that there was a lack of direction and prioritization of work because they were on several IPTs simultaneously. In some instances these same managers noted that returning to centralized, functional control would improve productivity by eliminating ambiguity and by enabling intra-functional interfacing that was not possible under the current IPT structure. However, not all "team members" were assigned to IPTs. In all four case study organizations, Contracting and Finance people were functionally assigned and controlled. This structure, many IPT members noted, resulted in subordination of IPT and product objectives to functional office objectives. Conversely, some IPT members noted that IPTs were sometimes "independent" product teams that acted in isolation not unlike a "stovepipe" functional office. This is consistent with previous research (8; 23).

In the larger context, individuals, even when assigned to IPTs, were controlled by a functional specialist from the Center-level and within the SPOs. Reporting chains, without regard for IPT assignment, in many cases followed the functional chain. In addition, many managers noted that, even within the same single manager organization, the organizational structures at the PC and the ALC were not matched. That is, a subsystem may be managed by an IPT at the PC, but managed by a matrixed team or individuals in different functional offices at the ALC. This arrangement was not necessarily ineffective. However, variations caused confusion over who had decision authority. These findings are also consistent with those in previous research (7; 8; 23).

Of course, organizational structure is not entirely under the control of a single manager. For instance, in the case of a consignment, one single manager transfers product management authority and shares responsibility for a subsystem to another

single manager. In this case, consistency between the PC and ALC organizations under two separate commanders is difficult to achieve. Therefore, compatibility, not consistency is the key issue.

Another important factor at both PCs and ALCs is the control of resources. The Center Commanders control manpower allocations and certain funds, such as those for depot maintenance activities. Center Commanders are charged with managing workload priorities and manpower allocations (4). Under this system SPOs compete for resources. Ultimately, SPO manpower strength has a significant impact on the organizational structure.

TABLE 8. STEPS TO IWSM (1:18.21; 4:27)

• Think Process Design - Then Organizational Structure
• Those People Who Perform the Job Know Best - Ask for Their Input
• The Goal is to Serve the Customer - Not to Protect Ones' Turf
• One Product - One Boss
• Develop Partnerships of Shared Authority - Not Autonomy
• Accountability - To those who Direct You
            - To Your Customers
            - From Cradle-to-Grave

As noted above, there is no single correct organizational structure. The nature of the product, the life cycle phase, and the nature of the work affect the design of an effective organizational structure. However, single managers should understand that hybrid structures incorporate both advantages and disadvantages. In an effort to optimize the advantages, "easy steps" to develop an IWSM organization are recommended to managers (1; 4). Several pertinent steps are listed in Table 8.

ANSWERING THE RESEARCH QUESTION

The research question is "How does the way selected AFMC organizations operationalize the IWSM concept of 'seamless processes' affect the shifting of the 'center of gravity' of product management from acquisition to sustainment units?" To answer this question, I will address the key terms.

Seamless Processes. With regard to "seamless processes," none of the case study organizations expanded on this concept in greater detail than does the IWSM Guide (4). "Seamless processes" essentially refers to integrating acquisition and sustainment activities across the life cycle (4). In similar broad terms, one case study organization's IWSM Plan described "seamless processes" as follows: "The SPD will ensure the...SPO operates in an integrated way, simultaneously within each process and across all the processes. The objective is to remove or minimize all process seams between organizations, locations, or program phases" (12:2). In the interviews, no one offered a more specific definition. Additionally, when answering Question 4, "What does the IWSM concept of 'seamless processes' mean in your organization?," managers described individual behaviors or attitudes that acted as constraints to teamwork, coordination and communication between "functionals," and between PCs and ALCs. This perspective focuses on individual behavior as the key to achieving "seamless processes." One manager commented, with regard to "seamless processes," that "Reading the IWSM Guide or the CONOPS [concept of operations plan] will not make it happen, people make it happen."

Since "people make it happen," "seamless processes" should be evaluated in terms of individuals' impact. On an individual level, the allocation of work is a key

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factor. One manager assessed both civilian and military perspectives on workload allocation in commenting that his organization was "no where near 'seamless processes.'" He stated that the civilian workforce perspective is "we've done it this way for years and years,..." and the military perspective is based on the senior leaderships' unwillingness to relinquish "any control." Further, he noted that if military "give away responsibility you diminish the scope of your job, and civilians don't want to assume any more workload." These comments only represent one person's opinion. In the case studies there are equally frank and persuasive statements that directly contradict the one quoted here. However, in both cases "seamless" is interpreted as the ease or efficiency of interaction between individuals performing different functional tasks supporting both acquisition and sustainment activities. It is precisely because there is some degree of overlapping functional capability at PCs and ALCs that the issue of workload allocation arises. For this reason, transition and consignment agreements are developed to delineate who will perform what tasks on which systems, subsystems, or components. These agreements formally allocate product management workload, and delegate authority and responsibility. The individuals developing these agreements or determining the status of "maturity indicators" are, usually, the same individuals who are transferring and receiving product management duties.

In some organizations the interaction between individuals performing acquisition or sustainment tasks is relatively "seamless." That is, these managers work together to perform their specific duties and the distinction between acquisition or sustainment tasks is irrelevant. In two case studies, managers from both PC and ALC organizations noted that the workload was effectively allocated through the normal course of managing the product as it progressed through its life cycle. In fact, one manager

noted that developing the transition agreement seemed like a step backwards since much of the workload decisions had already been made. However, the managers involved in those case studies also noted that the agreement was necessary because certain specific authorities had not or could not informally flow from the acquiring to the sustaining organization, e.g., engineering authority. Additionally, developing an MOA created a much needed reference document that identified to which organization specific components and duties were assigned.

Center of Gravity. Similar to the concept of "seamless processes," the IWSM concept of "center of gravity" was not specifically defined in any of the case study organizations. Interview Question 6 asked, "Does the concept of an organizational 'center of gravity' apply to your organization?" Answers may be divided into two common perceptions of this concept. First, some managers viewed the "center of gravity" as equivalent to the location of the single manager. In this case, the single manager was located at the Center where the majority of product management tasks occurred. This relates to the notion of "center of gravity" expressed in the IWSM Guide (4). That is, life cycle management and maintaining management continuity in which

> A weapon system program office remains at the product center until weapon system development is complete. The office may relocate to a logistics center later in its life when the predominant activity is operational support. The emphasis is on management continuity, not rapid transfer.... The product centers are focused on converting system requirements into operational systems. The logistics centers strength is supporting a weapon system in the field, providing the critical elements of combat readiness and sustainability.... Program office location will build on and sustain these strengths throughout the life cycle [italics in original]. (4:38)

However, not all managers agreed that the location of the single manager was the key indicator of the "center of gravity." In this vein, one manager stated that the "single

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manager is not the driver of...the 'center of gravity,' it's the mass of the effort that drives the location of the 'center of gravity.'"

Second, the majority of managers involved in the case studies viewed the "center of gravity" in terms of their own programs. For example, individuals managing subsystems or components noted that the overall system and the subsystem could have different "centers of gravity." As noted in the findings, there were several products that were in different life cycle phases and managed at different Centers from the single managers. According to managers involved with these products, the "center of gravity" was based on the individual subsystem or component. This point is important. A "center of gravity" for either the system or subsystems may be different. Moreover, the system "center of gravity," when defined in terms of the "mass of work," is not necessarily located in the same Center as the single manager.

Location of the single manager and the "mass" of work need not be at the same place. Three of the four case study organizations' single managers were located at ALCs. In all case study organizations, the predominant overall activity for the system was sustainment. However, all six specific cases investigated were formally managed by the PC portion of a single manager organization. This highlights the idea that the "center of gravity" for a subsystem or component may be different than the location of the single manager. In other words, there may be different "centers of gravity" for the system, and for each subsystem. Accordingly, one may infer that the location of the single manager is not (or less) important if that single manager decentralizes authority for product management. In one case, the SPD delegated authority and responsibility for a major system modification, which was equivalent in dollar value to procuring a new aircraft system, to the DSO. In other cases, authority was not delegated to the

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organization performing the majority of work. In these instances, formal transition or consignment was necessary to empower the organizations performing the work.

With regard to the concept of "center of gravity," one additional point must be noted. Several interviewees conveyed that the "center of gravity" was "blurred." That is, the concept was irrelevant due to the way their organizations operationalized the IWSM concept of "seamless processes." In these cases, the workload seemed to be effectively allocated to the most capable work unit without regard for the nature of the work. In these instances, the location of the single manager was irrelevant. The nature of work and the location of those people best qualified to perform that work was the key factor in assigning authority and responsibility.

A Research Question Answer. The research question is "How does the way selected AFMC organizations operationalize the IWSM concept of 'seamless processes' affect the shifting of the 'center of gravity' of product management from acquisition to sustainment units?" There is no single, clear, concrete answer to this question. To answer this question, one must define the concept of the "center of gravity." There are three possible perspectives. First, if the "center of gravity" is defined in terms of the location of the single manager, then it does not appear that the degree to which "seamless processes" are realized has a significant impact. It appears that broader management issues rather than product-specific issues influence the relocation of the single manager. That is, shifting the "center of gravity" is not linked with the IWSM processes of transition or consignment. Second, if the shifting of the "center of gravity" is defined in terms of the predominant processes involved in managing the overall system, then degree to which "seamless processes" are realized does have an impact. In this case, the seamlessness of business relationships

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between acquisition and sustainment units affects the transition process. Third, if the concept of "center of gravity" is defined in terms of specific products, e.g., subsystems or its components, the degree to which "seamless processes" are realized does have an impact. That is, in organizations that have a high degree of integration between acquisition and sustainment units, the workload will shift as the product requirements and management activities change during a product life cycle. Empowered managers allocate duties based on which work unit is best qualified to perform them. As a product matures the nature of the work changes from acquisition to sustainment tasks. Accordingly, workload assignment, as well as authority and responsibility for product management, will shift to work units that are best suited to perform sustainment duties. This does not obviate the need to formally delegate certain authority, to delineate organizational relationships, and to document assignment of responsibility for specific components. However, when there are "seamless processes" the shifting of the "center of gravity" is not totally dependent on formal processes which tend to be more divisive than unifying.

CONCLUSIONS

Six conclusions about the IWSM environment and "seamless processes" were derived from the findings. These conclusions are:

1. IWSM is applied differently in each organization and at each level because the individuals involved, the products, the nature of work, and the organizational structures vary.

2. The IWSM processes of transition and consignment are different from the pre-IWSM process of PMRT in several ways. Under IWSM the need to develop

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integrated, cradle-to-grave management affects the relationships between acquisition and sustainment organizations. The possibility of "reverse transfer" and changes in control of funds are differences in both the seamlessness and the life cycle approach to product management that are present under IWSM, but not prior to IWSM.

3. "Seamless processes" are the product of the way IWSM is interpreted and applied in each organizational unit.

4. The concept of an organizational "center of gravity" varies depending on an individual's perspective. This concept may be viewed from both a system or a subsystem perspective.

5. Shifting the "center of gravity" and the IWSM processes of transition or consignment may be, but are not necessarily, linked. This relationship depends on the interpretation and application of IWSM, and on managers' definitions of a "center of gravity."

6. The existence of a relationship between "seamless processes" and the shifting of the "center of gravity" is unclear. In general, relatively more "seamless" processes and organizations reduce the importance of the shifting of a "center of gravity." Ideally, the natural and efficient allocation of product management authority, responsibility, and workload will result in the most capable organization performing the tasks, regardless of whether the tasks are acquisition or sustainment related. The idea of a "most capable" organization involves both technical expertise in the IWSM core processes and the availability of resources to perform the work.

Neither IWSM nor "seamless processes," are ends in themselves. IWSM is a philosophy that espouses the use of "seamless tools" to integrate the efforts of different functional specialists, and individuals performing acquisition or sustainment tasks. The

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relationship between "seamless processes" and the organizational "center of gravity" is dependent on the degree to which acquisition and sustainment activities are integrated across a product's life cycle, and how "center of gravity" is defined. Although investigation of these concepts leads to greater understanding of the IWSM philosophy, managers should focus on how these concepts are perceived and affect individuals performing product management duties. The findings in this case study research indicate that individuals, the nature of work, and organizational structure are important variables that affect an organization's ability to realize "seamless processes." More importantly, the fundamental question inherent in the IWSM philosophy is not the degree of seamlessness an organization has achieved, but whether the way "seamless processes" are operationalized best supports its ability to deliver a product that satisfies customer requirements in terms of cost, schedule, and performance throughout the product's life cycle.

The primary factors affecting "seamless processes" are: the individual, the nature of work, and the organizational structure. Of course, it would be simplistic to posit that these three factors alone can explain the performance of an IWSM organization. However, these three factors are likely to be the roots of other factors affecting the realization of "seamless processes." The primary and other factors affecting an IWSM organizational system are displayed in a model (see Figure 5).

An IWSM organizational system contains many elements that must work in concert to enable individuals to focus on acquiring and sustaining products. IWSM provides a philosophy that may be molded to fit different organizations and circumstances. The interaction of elements internal and external to the single manager organization affects the way "seamless processes" are operationalized and realized.
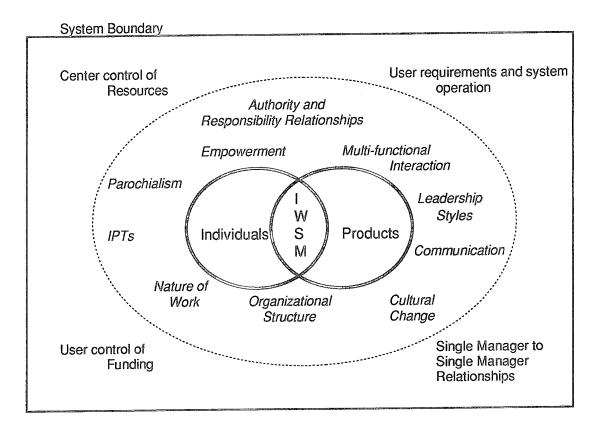
FIGURE 5. MODEL OF AN IWSM ORGANIZATIONAL SYSTEM

Figure 5 is a model of an IWSM organizational system. This model includes

elements that represent factors affecting the degree of seamlessness in organizations.

AFMC and customer elements that affect a single manager organization are depicted

within the system boundary. The single manager organization is represented by the

dotted ellipse. Factors affecting seamlessness, as noted in this and previous research,

that are within the control of a single manager are included within the dotted ellipse.

Factors that are controlled by external organizations are outside the dotted ellipse. The

primacy of the individual, the product, and the IWSM philosophy form the core of the

model. The model is an open system in which all elements interact and affect other elements.

RECOMMENDATIONS FOR IMPROVEMENT

Several managers in the case study organizations stated that a command policy or guidance on the IWSM processes of transition or consignment would promote standardization across and within organizations. This is particularly important due to the turnover related to the workforce draw-downs. Others noted that their organizational policies were satisfactory, but did not always have "buy-in" from all the parties involved. A common policy might alleviate this problem. In addition, inherent problems with communications between acquisition and sustainment organizations could be mitigated through standardization of terms and general procedures.

Appendix C is proposed guidance on the processes of transition and consignment. The guidance is based on several existing SPO operating instructions (OI) and inputs from managers involved in the case studies. This guidance is not intended to be an all- inclusive, step-by-step approach to performing these processes. The guidance is a broad primer addressing key issues. One issue included in the guidance is to develop a database for tracking transition/consignment of systems, subsystems, components, or parts and key issues. Important information that should be included in this database are the consignor and consignee organizations, the dates that critical "maturity indicators" were satisfied and the date the agreement was signed. Documenting transition/consignment agreements may be as simple as making them attachments to the IWSM Plan or CONOPS. Including these agreements will make the IWSM Plan or CONOPS a "living document" as described in the IWSM Guide (4).

Thorough documentation is important because it provides a resource to improve continuity that is not affected by personnel turnover. Additionally, with the anticipation of fewer new system acquisitions, existing systems will be undergoing "life extending" modifications to existing system and subsystems. Having proper documentation of previous transition/consignment agreements will minimize duplication of effort and potential conflict between organizations involved.

RECOMMENDATIONS FOR FUTURE RESEARCH

This study touched on many issues that warrant further research.

1. Investigate the processes of transition and consignment in more detail to determine if a new AFMC policy will improve standardization without adversely affecting organizations' ability to innovate.

2. Investigate IWSM organizational structures to determine if different organizational structures are better suited for different phases in a product life cycle.

3. Investigate the implications to IWSM of the emerging concept of "system of systems" as it applies to unifying management of DOD products within the same mission area.

4. Investigate the potential, relevance, or existence of "virtual organizations" with respect to the IWSM concept of "seamless" processes and organizations.

5. Investigate and compare commercial implementation of the concepts of integrated product development and total quality with IWSM implementation in AFMC organizations.

6. Investigate and analyze SPO metrics that measure customer satisfaction to determine the validity, usefulness, and applicability of the measures.

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Appendix A: Acronyms and Definitions

1. **AFLC:** The Air Force Logistics Command, 1961-1992, was responsible for providing program management, periodic maintenance and supply support (for reparable items) support to operational Air Force weapon systems,. The Command operated five depot maintenance facilities (see ALC).

2. **ALC:** Air Logistics Center. There are five ALCs: Warner-Robins, Oklahoma City, San Antonio, Sacramento, and Ogden. ALCs provide sustainment and depot maintenance for Air Force and DOD weapon systems.

3. **AFMC:** The Air Force Materiel Command. Formed in July 1992, AFMC manages acquisition and sustainment of Air Force products. The Command has approximately 116,000 people, 14 bases, and manages 45 percent of the Air Force budget (17).

4. **AFMCP 800-60:** Air Force Materiel Command Pamphlet, IWSM Guide (4).

5. **AFSC:** The Air Force Systems Command was responsible for weapon system acquisition and development.

6. **CCB:** Configuration Control Board is a group of managers responsible for reviewing and approving changes to a weapon system configuration baseline. These changes may be based on engineering change proposals, deviations, waivers, advance change study notices or other documents used to initiate changes in system configuration. Board members should represent all applicable product management disciplines to provide the Board Chairperson with the best advise on system configuration management (19).

7. **COE:** Centers of Excellence is defined in AFMCP 800-60 as a "Command designated pool of experienced people who are available for the single manager to draw upon for either development or sustainment. COEs may be established at either" PCs and/or ALCs, and are the source of DSM, SSM, staff, and IPT members depending on the single manager's needs (4:48).

8. **CONOPS:** Concept of operations

9. **DMAWG:** Depot Maintenance Activation Working Group. These groups plan and develop depot-level product repair and support capability.

10. **DSM:** Development System Manager is the lead manager at a Product Center when the SPD, PGM, or MGM is located at an ALC and delegates specific developmental authority and assigns taskings to a Product Center portion of its organization. The DSM reports directly to the single manager (4).

11. **DSO:** Development System Office.

12. ECP: Engineering Change Proposal is a request to change a product's hardware or software.

13. IPD: Integrated Product Development is one of eight tenets of AFMC's IWSM philosophy. IPD is defined as "a philosophy that systematically employs a teaming of functional disciplines to integrate and concurrently apply all necessary processes to produce an effective and efficient product that satisfies customers' needs" (4:232).

14. IPT: Integrated Product Teams are cross-functional teams that are formed for the specific purpose of delivering a product or managing a process for a customer (3:18).

15. IWSM: The Integrated Weapon System Management philosophy is AFMC's approach for managing acquisition and sustainment processes for Air Force products (4).

16. LRU: Line replaceable unit is a system component which operational-level technicians remove and replace, but do not perform any internal repair, i.e., a "black box."

17. MGM: Materiel Group Manager manages a basket of similar subsystems which receive consolidated management for sustainment to take advantage of economies of scale and specialization of technical/engineering skills. Products managed in this group have no ongoing development (4).

18. MOA: Memorandum of Agreement.

19. OI: Operating Instruction.

20. PC: Product Center. There are three PCs in AFMC: Aeronautical Systems Center at Wright-Patterson AFB OH, and an ASC detachment at Eglin AFB FL, and the Electronic Systems Center at Hanscom AFB MA. System acquisition and development are the traditional focuses and processes performed at PCs.

21. PEO: Program Executive Officer is the corporate operating official who supervises a portfolio of mission-related acquisition category (ACAT) I and selected programs. There are six PEO categories: bombers, information systems, tactical/airlift systems, space systems, command-communications-control systems, and weapon systems (4).

22. PER: Process Effectiveness Review is a formal assessment of AFMC processes conducted by HQ AFMC personnel and augmentees. This review is similar to a staff assistance visit in which an outside agency evaluates and recommends improvements to operating units (16).

23. PGM: Product Group Manager is a single manager over a basket of similar subsystems in which a large sustainment effort and ongoing development occurs.

A PGM is manages all cost, schedule, performance parameters for the basket of similar products (4).

24. PMRT: Program Management Responsibility Transfer was the pre-IWSM process of transferring PM authority, responsibility and workload from ASFC product center to AFLC air logistics center organizations. PMRT represented a clear break between acquisition and sustainment functions. PMRT, ideally, was the "orderly, timely, and efficient" transfer of program management responsibility. This process occurred incrementally at the end of the production phase and the beginning of the operational phase in a system life cycle (10).

25. SPD: System Program Director is a single manager who is ultimately responsible and accountable for decisions and resources in overall program execution of an Air Force system. Directs acquisition and sustainment processes for a weapon system, and provides a single face to the user (s) by developing "seamless processes" (4:235).

26. SPO: System Program Office is an "integrated AFMC organization responsible for cradle-to-grave military system management," and is headed by an SPD (4:235).

27. SSM: System Support Manager is the lead manager at an Air Logistics Center responsible for sustainment activities when the SPD, PGM, or MGM is located at another center. The SSM reports directly to the single manager (4).

28. SSO: System Support Office.

29. TO: Technical Order.

Appendix B: Interview Protocol

A. Introduction

Statement of Use: I appreciate your assistance in gathering data about IWSM. Your participation in this interview is completely voluntary. Your responses will be treated confidentially, and will remain anonymous. Any reference to data you provide will be described in terms of the subject matter without reference to the exact source, except by describing your organization in terms of acquisition category, phase of the program you are supporting, by type of organization or work unit (e.g., an IPT member...), and by whether the you are at a Product Center or Logistics Center. The final product of this research will be an AFIT thesis. Distribution of the thesis will be unrestricted. The sponsor for this research is the AFMC IWSM Policy Office in the Requirements Directorate, HQ AFMC/DRI.

B. Purpose of the Study

This research is attempting to identify how different AFMC organizations operationalize the IWSM concept of "seamless processes." Toward this end, we are interested in understanding the processes of "transition" and "consignment." Our goal is to learn how AFMC single manager organizations integrate development and sustainment processes performed by different functional elements internal to a product organization. Additionally, we are interested in how separate single manager organizations allocate authority and responsibility within their own organizations and between other single manager organizations to manage resources required to support a product throughout its life cycle.

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The research question is "How does the way selected AFMC organizations operationalize the IWSM concept of 'seamless processes' affect the shifting of the 'center of gravity' of product management from acquisition to sustainment units?" Three definitions are required to explain our approach. First, IWSM, is defined in AFMCP 800-60, as a "management philosophy for acquiring, evolving, and sustaining our products. It empowers a single manager with authority over the widest ranges of decisions and resources to satisfy customer requirements throughout the life cycle of the product." Second, "seamless processes," a central concept in IWSM, are grounded in a framework that relates products and processes at all organizational levels. "Seamless processes" involve a single management system that relates requirements, planning, resource allocation, execution, and program tracking over the total life cycle. A single manager provides a single point of authority and responsibility, and focuses product management efforts on satisfying customer needs. Third, the concept of "center of gravity" refers to the location of the single manager. That is, whether the program director is located at the developing or the sustaining organization. Location of the single manager depends on the process, e.g., development, production, modification, or sustainment of fielded systems, that is the predominant focus of program management.

Our objective is to learn how your organization is evolving under its own unique version of IWSM. We do not intend to judge the correctness of your approach. Only to report how your approach implements the realization of "seamless processes," as defined by your organization.

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C. Demographic Questions

1. What is your grade and position? _____

2. What is your specialty (e.g. Contracting, Finance, Engineering, Maintenance,...)

_____

3. To what program are you assigned? _____

4. What is the acquisition category of this program?

5. What is the phase of system life cycle your organization is currently supporting?

        Phase 0, Concept Exploration and Definition
        Phase 1, Demonstration and Validation
        Phase 2, Engineering and Manufacturing Development
        Phase 3, Production and Deployment
        Phase 4, Operation and Support

6. Do you work at a Product Center or Air Logistics Center?

7. In what type of work unit are you assigned?

        Functional Office (e.g. Contracting, Finance, Engineering, a Staff Position)
        Integrated Product Team (IPT)
        Other _____

8. The individual who writes your performance report is assigned to...?

        The same Center   A different Center
        The same Functional Office   A different Functional Office
        The same IPT   A different IPT
        Other. _____

9. What is the number of years of experience you have working in acquisition and/or sustainment jobs?

        Experience at a Product Center   _____
        Experience at an Air Logistics Center   _____
        Other. _____ _____
        Total Acquisition and Support Experience _____

10. What is the number of years of experience you have worked in acquisition and/or sustainment jobs prior to the merger of AFLC and AFSC in July 1992? _____

11. Have you attended an official Quality Air Force training course?   YES   NO

12. Have you attended an official IWSM or IPD training course?   YES   NO

D. Interview Questions

1. When you think of IWSM, what comes first to your mind?

2. Has the implementation of IWSM affected your organization? If so, how?

3. Has IWSM changed the way you perform your job? If so, how?

4. What does the IWSM concept of "seamless processes" mean in your organization?

5. What is the scope and amount of interaction with geographically separate units *within* your single manager organization?

6. Does the concept of an organizational "center of gravity" apply to your organization?

7. How does your organization implement the process of "transition" (i.e. workload transfer)?

8. How does your organization implement the process of "consignment"?

9. How does your organization perform the processes of transition or consignment?

    a. How is planning conducted? Who is involved?

    b. What are the major issues addressed? How are these issues determined?

    c. How does your organization decide when (if) transition or consignment will occur?

    d. What is the product of transition or consignment?

    e. How are the decisions and outcomes of these processes documented?

10. Following transition or consignment, how is your organization involved in product management?

11. Does your organization use any metrics to measure the processes and products of transition and consignment?

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E. Definition of Terms

- Research Question: "How does the way selected AFMC organizations operationalize the IWSM concept of 'seamless processes' affect the shifting of the 'center of gravity' of product management from acquisition to sustainment units."

- Research objective is to learn how your organization is evolving under its own unique version of IWSM. We do not intend to judge the correctness of your approach. Only to report how your approach implements the realization of "seamless processes," as defined by your organization.

- Integrated Weapon System Management (IWSM) is a "management philosophy for acquiring, evolving, and sustaining our products. It empowers a single manager with authority over the widest ranges of decisions and resources to satisfy customer requirements throughout the life cycle of the product." Defined in AFMCP 800-60.

- "Seamless Processes" are a central concept in IWSM. They are grounded in a framework that relates products and processes at all organizational levels. "Seamless processes" involve a single management system that relates requirements, planning, resource allocation, execution, and program tracking over the total life cycle. A single manager provides a single point of authority and responsibility, and focuses product management efforts on satisfying customer needs.

- "Center of Gravity" refers to the location of the single manager. That is, whether the program director is located at the developing or the sustaining organization. Location of the single manager depends on the process, e.g., development, production, modification, or sustainment of fielded systems, that is the predominant focus of program management.

- Transition, or workload transfer, involves a shift in the center of gravity from the PC to the lead ALC. The SPD position of a major system is relocated to the sustaining ALC because the focus shifted from developing and producing to sustaining an operational system. Transition occurs within the same product organization. It involves relocating the position of authority and responsibility, the single manager, from the PC to the SSM (lead ALC) location.

- Consignment occurs when a product, i.e. a subsystem or component, is developed and produced by one Single Manager organization (e.g. the SPO), and the responsibility for sustainment is shifted to another Single Manager, (e.g. a Product Group or Material Group organization). Responsibility for subsystem management remains with the SPD throughout the life of the system. Authority and responsibility for system management is shared between the two Single Managers (SPD and PGM or MGM), and the SPD performs oversight of product management for consigned subsystems.

- PMRT was the process of transferring program management responsibility from the developing organization to the supporting organization. The objective was to accomplish PMR in an "orderly, timely, and efficient" way at "the earliest practicable

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date during the production phase." A PMRT plan was devised by the TWG and was usually documented in a MOU or MOA. When approved by Air Staff, this document was used to update the PMD. Planning for PMRT ideally started two years prior to the end of major system production. PMRT actually was designed to occur after system transition to the user, and between six months prior to six months after completion of production.

Appendix C: Proposed Guidance on the IWSM Processes of Transition and Consignment

I. General

This guidance addresses key issues involved in the IWSM processes of transition and consignment. The primary purpose of transition or consignment is similar. That is, to assure the "orderly, timely and efficient" transition of product management authority, responsibility, and workload of systems, subsystems or equipment from the acquiring organizations to the sustaining organizations. Transition occurs within a single manager organization. Conversely, consignment occurs between two or more separate and autonomous single manager organizations. A single manager is a System Program Director, (SPD), a Product Group Manager (PGM), or a Materiel Group Manager (MGM). A single manager is charged with developing an organizational environment in which "seams" between acquisition and sustainment activities are minimized.

IWSM provides the philosophical foundation for building "seamless" organizations and processes. Creating cradle-to-grave management requires multi-functional, intra- and inter-organizational interaction and teamwork. Moreover, creating "seamless" cradle-to-grave management requires integration of acquisition and sustainment people throughout a product's life cycle. Due to geographic separation and "cultural differences" between the acquisition and sustainment communities, developing viable communications channels and fostering effective communication, i.e., exchange of information based on a mutual understanding of each others' needs, are critical activities. In general, greater integration and more effective communication

between acquisition and sustainment organizations may produce a product management environment in which the transfer of authority, responsibility, and workload will occur as a normal outcome of doing business. However, the realization of "seamless" processes and organizations as described above does not preclude the need to develop formal transition and consignment agreements. These agreements define the business relationships between different organizations and may be required to formally and officially transfer authority, such as engineering authority. Under ideal circumstances, transition or consignment agreements will formally document business relationships and delineation of product management authority, responsibility, and workload that have already occurred through integrated, "seamless" activities.

Transition and consignment are similar processes with similar objectives. However, there are differences. Transition usually involves a whole system. Conversely, consignment involves subsystems or components. Both processes occur incrementally. That is, both systems and subsystems may be divided into discrete parts, such as a line replaceable unit (LRU) or a shop replaceable unit (SRU).

Transition or consignment for each part occurs individually. In general, these processes occur when the day-to-day activity has clearly shifted from acquisition to sustainment activities. Transfer of product management authority, responsibility, and workload from a product center to one or more logistics center organizations results in better utilization of AFMC centers of excellence, and, in the case of consignment, will improve economies of scale and effort.

IWSM, and the unified AFMC and single manager organizational structure, make the processes of transition and consignment different from previous methods of transferring program management responsibility. IWSM requires a system single

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manager to retain responsibility for a product throughout its life cycle. Accordingly, the process of transition involves a shift of product management authority and workload from acquisition to sustainment units within the same single manager organization. Consignment, on the other hand, involves a transfer of authority and workload for subsystems or components between two separate and autonomous single manager organizations. Under consignment, responsibility to customers is shared by the system and subsystem single managers. Both organizations must be responsive to customer needs. Equally important, both organizations must work together to ensure that product management activities performed by each are mutually supportive. Consignment agreements should define integrated business relationships that allow for autonomous action, but foster a high degree of communication and coordination of product management activities.

A fundamental difference between the IWSM processes of transition and consignment and pre-IWSM program management responsibility transfer (PMRT) is that system single managers remain involved with product management throughout the entire life cycle. This has two implications.
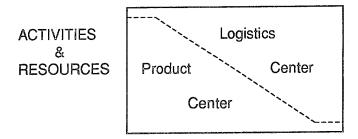
First, in the case of transition, the system single manager has the authority to allocate product management responsibility and workload to whichever unit in the organization is best capable of performing the tasks, regardless of whether the tasks are traditionally acquisition or sustainment duties. Additionally, the system single manager can direct a "reverse transfer" of product management responsibility and workload. This occurs when a system or subsystem has been transferred from acquisition to sustainment units, and is later returned to acquisition units due to the

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nature of the work being performed. An extensive system modification is one possible instance where a "reverse transfer" may occur.

A second implication of a single manager's life cycle responsibility is that even though consignment involves two or more single manager organizations, there is no complete and irreversible break between acquisition and sustainment organizations. That is, under PMRT there was a complete break between acquisition and supporting organizations. Transfer represented a "hand-off" of program management authority, responsibility, and workload. Now, under IWSM, consignment involves a transfer of authority, but a sharing of responsibility and workload for subsystems. The system single manager (an SPD) remains responsible to customers for system form, fit, and function. Similarly, the subsystem single manager (a PGM or an MGM) shares the responsibility to provide a satisfactory product to its customers. Although this relationship appears to present two faces to customers, the delineation of responsibility and workload, and the development of effective communication channels between the system SPD organization and the sustaining PGM or MGM organizations can achieve sufficient integration to eliminate duplication of effort and to provide efficient product management.

Figure 1 indicates that neither product center nor logistics center organizations should be excluded from contributing to product management activities during a system/subsystem life cycle. To apply this figure to the PMRT process, a solid vertical line at the point when program transfer occurred would be drawn. However, under IWSM there is a dotted, angled line representing the life cycle involvement of both acquisition and sustainment organizations, and the flexibility to transfer product management when product-specific and management concerns indicate readiness.

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Additionally, the dotted line also indicates the ability to "reverse transfer" to allocate responsibility and workload to the best capable organization regardless of the life cycle phase.

TIME (System/Subsystem Life Cycle)

FIGURE 1. SHIFTING PRODUCT MANAGEMENT

Determining what products and when to transfer product management is under the control of the involved single manager(s). Typically, products are transferred incrementally. Products may be delineated into discrete, stand-alone units, similar to work-packages. Quantitative and qualitative product-specific criteria for determining readiness to transfer should be developed. This process is both subjective and objective. The result is a set of "maturity indicators" that can be used to gauge the stability of key product attributes. These criteria should be understood and supported by both the losing and gaining organizations. To achieve mutual support the processes of transition and consignment should be planned for "up-front" in the organization's IWSM Plan or CONOPS. Establishing transition/consignment working groups or integrated product teams will facilitate multi-disciplinary and multi-organization input into the process. These teams should be initiated while the system or subsystem is in

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production. Additionally, these teams should work in concert with other teams involved in developing sustainment capability, such as the Depot Maintenance Activation Working Group (DMAWG). Ultimately, single managers have the authority to determine when a system or subsystem is "ready" for transition or consignment. Of course, there are other management issues, such as manning and funding, outside the control of single managers that affect the ability to transfer authority, responsibility, and workload from one organization to the next.

II. Policies and Procedures

Transition and consignment procedures are outlined below. This outline provides broad guidelines for the transition and consignment processes. These policies and procedures are based on case study interview inputs and case study organizational operating instructions. These procedures should be amended or modified as required to suit the particular circumstances and organizational approaches to the IWSM philosophy.

A. General Policy and Procedures.

1. Developing a Transition/Consignment Plan early in the life of a product will facilitate efficient product management. The plan should include the objective, policy and procedures, and overall assignment of organizational responsibilities affecting the process. The plan should establish "maturity indicators" to ensure that system/subsystems are sufficiently stable and that support capability is available to transfer product management. Coordination and agreement on the contents of the Plan by all participants should be obtained. Documentation of the

transition/consignment process should be made in the IWSM Plan, CONOPS, or the Weapon System Master Plan.

2. Developing a Memorandum of Agreement (MOA) that completely and clearly delineates product-specific and key managerial issues is necessary. This MOA documents the business relationship between acquiring and sustaining units within a single manager organization, and between two or more separate and autonomous single manager organizations. The MOA should contain pertinent information on the affected system/subsystem that focuses on two issues: the status of the system and capability of the gaining single manager organization to provide day-to-day product management.

3. While the Plan is a general guide, the MOA provides detailed assignments of responsibilities, specific data (i.e., part number, national stock number, nomenclature, etc.), planned product improvements, technology insertion issues, maturity indicators, funding requirements, terms and conditions, timing milestones, and target dates for completion of transition/consignment.

4. Transition/consignment planning may be included as part of the program baseline. Target dates may be used in the program metrics.

5. Transition/consignment MOA signed by the appropriate single managers, or their deputies, must be obtained. The signed MOA signifies acceptance by all parties of the responsibilities assigned. The gaining single manager will notify the customer of the transition/consignment via written correspondence.

B. Specific Policies and Procedures.

These following proposed policies represent a composite of several existing transition/consignment operating instructions:

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1. The consignee assumes total responsibility for all product management activity not specifically assigned to the Product Center as documented in individual transition/consignment agreement(s).

2. The initiator of a change to a product assumes total responsibility for the change, and for changes to other products affected by the change, regardless of whether the acquiring or sustaining organization has management responsibility for the product.

3. The acquisition organization (the SPO or Development System Office) will continue to assist the sustaining organization by providing its contracting channels and organic engineering resources on a case-by-case basis.

4. All subsystem peculiar support equipment (e.g., interface test adapters and associated test data) will be consigned along with the subsystems it supports. Depot equipment not delivered as of the transition/consignment date may be transferred with the product it supports subject to the conditions of the MOA.

5. The SPO or DSO will not approve any configuration change to consigned subsystems without coordination with the appropriate product SPD. The Product or Material Group Organizations will not approve any configuration change impacting form, fit, and function without prior coordination and approval from the system SPD organization.

6. Workload allocation will be clearly identified in the transition/consignment agreement. "Residual tasks", i.e., work that was in progress when the transfer occurred and for which it was not practicable to transfer, will be clearly identified.

7. The following four items should be addressed in transition/consignment agreements:

    a. Hardware:

        1. Identified by part number and national stock number.

2. Identified at the Line Replaceable Unit (LRU) level or major component level, and Shop Replaceable Unit (SRU) level.

3. Support Equipment (SE) listed at the SE Requirements Document (SERD), tester or tool-level.

4. All approved configuration(s).

b. Software:

1. Identified by Computer Program Identification Number (CPIN).

2. Operational Flight Programs (OFP) listed in agreements separate from the LRUs.

3. Product Test Program Sets (TPS) listed in the supported system's transition/consignment agreement.

4. SE system software listed in the SE transition/consignment agreement.

c. Technical Data:

1. All organizational, intermediate, and depot technical order (T.O.) publications, including test procedures manuals, identified with the supported system's transition/consignment agreement.

2. SE T.O.s listed in the SE transition/consignment agreement.

3. Identified by T.O. number, latest, change, and date.

4. Engineering drawing level required to validate technical orders and to solicit alternative sources of supply for reparable items.

d. "Maturity Indicators:"

These indicators serve as measures of readiness to transition/consign a product. Quantitative and qualitative measures listed below are used to assist

acquisition and sustainment mangers in determining a product's "readiness" for transfer. A heuristic for when to transition/consign a system/subsystem is on the date of completion of the last maturity indicator. Note that this is not a hierarchical list and that not all "maturity indicators" are applicable to all products.

Provisioning. Level of support spares programmed, procured, and fielded. A key milestone is the date that provisioning is accomplished.

T.O. Delivery and Maintenance. Level of usage and maintenance data available to the field. A key milestone is the date that the required Organizational and Intermediate (O & I) level SE is fielded at sites operating the system.

O & I SE Delivery. Indicates level of operational support that can be provided for the product. A key milestone is date the SE is fielded at sites operating the system.

Functional Configuration Audit/Physical Configuration Audit (FCA/PCA) Completion. Firmness of a product's baseline. A key milestone is the completion dates of FCA/PCA.

Reprocurement Data. Ability to re-procure the product from a source other than the original manufacturer based on the level of detail in the technical data and drawings. A key milestone is the date that data requirements are placed on contract.

Product Quality Deficiency Reports (PQDR). Existence of problems or deficiencies with the product after it is operational. A key milestone is the date that the last PQDR for which the SPO retains responsibility is closed.

Corrections. Level of corrective action required for a product initiated by Engineering Change Proposals (ECP). A key factor is the number of outstanding ECPs and a key milestone is the date that open corrective actions are placed on contract.

Depot Support Plan. Indicates future ability of the System Support Manager/PGM/MGM to organically test and repair a specific products without contractor assistance. A key milestone is the date that depot support, including depot T.O.s, is placed on contract.

Integration Risks. Anticipated extent of future changes to the product caused by a change in other interfacing products. A key milestone is the level of risk associated with related development.

Interim Contractor Support. Indicates support for reparable assets until organic repair can be established.

III. Transition/Consignment Worksheet

System Name:

Work Unit Code:

1. Has provisioning been accomplished? If not, when will it be accomplished?

2. Have T.O.s been contracted? If not, provide status.

3. Has Organizational and Intermediate-level SE been fielded? If not, identify items required and provide status.

4. Has FCA/PCA been completed? If not, identify estimated completion date.

5. Has reprocurement data been contracted? If not, give estimated contract award date.

6. Are there outstanding PQDRs? If so, provide OPR and the anticipated closure date.

7. Are there outstanding ECPs to correct deficiencies? If so, document on the Record of Outstanding ECPs and provide contract award date.

8. Is the depot support contracted? If not, give the estimated contract award date.

9. Are integration risks from known related developments low? If not, identify the impacts and estimated completion date of the efforts.

10. Target Transition/Consignment date is:

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13. ABSTRACT (Maximum 200 words)

This research investigated the way four Air Force Materiel Command (AFMC) single manager organizations operationalized the Integrated Weapon System Management (IWSM) concept of "seamless processes." In this thesis, the IWSM concept of "seamless processes" refers to the degree of integration between acquisition and sustainment organizations. Four SPO organizations were involved in six case studies. This research focused on the way "seamless processes" affect the shifting of the organizational "center of gravity" within or between single manager organizations. An interview questionnaire was administered to 13 Product Center managers and 6 Logistics Center managers. The interview questions focused on IWSM in general, "seamless processes," and the IWSM processes of transition and consignment. These two processes are the formal means for transferring product management authority, responsibility, and workload within and between single manager organizations. Research findings indicate that individuals, the nature of work, and the organizational structure affect the development of "seamless processes." Also, in organizations that have mitigated "seams" between acquisition and sustainment functions, transfer of product management authority and responsibility occurs informally. In other instances, product-specific or managerial issues create "seams" that require formal agreements delineating authority and responsibility relationships between Product and Logistics Center organizations.

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