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## Military Applications of Stratified Systems Theory

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### Military Applications of Stratified Systems Theory T. O. Jacobs

This chapter will describe work accomplished during the past six years, much of it by Professor Jaques himself, to investigate the applicability of Stratified Systems Theory (SST) within the U.S. Department of Army. Two broad possible areas of application were apparent at the outset. The first concerned the structure of the very large department and its subordinate elements. (With a uniformed strength of approximately 780,000 and a civilian strength of more than 400,000 the Department of Army matches in scope and scale the largest of private sector multinational corporations.) The second concerned executive leadership, and the process whereby executives (senior generals) are developed within the Department. (The possibility of meaningful sequential development is inherent in the SST formulations of progressive complexity of performance requirements in successively higher strata of large scale organizations.)

Initial efforts to test the applicability of SST within the U.S. Army began in 1979 with Army Research Institute commitment to sponsor continued research on SST by the Brunel Institute of Organisation and Social Studies. The work accomplished under this agreement focused largely in two areas. One was continuation of efforts by Gillian Stamp to develop, standardize, and test methods for assessing cognitive power, a central construct in SST as Elliott Jaques had formulated it (Jaques, 1978). The second was continued theoretical development by Jaques himself, both to investigate hypotheses about SST Strata in senior U.S. military headquarters, and to relate issues of adult cognitive development to the well documented system of discrete levels of organizational performance requirements that constitutes SST.

SST has at its heart two general propositions. The first is that the level of work of any position in a hierarchical organization can be objectively measured by its time span. (A later assumption was that objective measures of work complexity could be developed that were independent of time span.) Time span is the maximum allowed completion time of the longest tasks, assignments, project or programs which the superior assigns the subordinate in the position being assessed. The second proposition is that there is an optimum structure for each organization, consisting of a specific number of Strata (or levels), regardless of the nature of its work. The actual number any given organization should have depends on its size, the complexity of its direct output work, and the requirement that each stratum add value to both its higher and lower Strata. By and large, within a large scale organization, it is assumed that a maximum of seven levels will encompass the span of complexity from the very top to the very bottom.

The broad scope of Stratified Systems Theory, as outlined in *General Theory of Bureaucracy* (Jaques, 1978), provides a very powerful lens for examining organizational structure, redesigning organizations, establishing required leadership tasks by organizational level, and establishing leader development programs. A key question that had to be answered before such applications could be made within the military was *whether* or not the parameters found to

characterize private sector organizations would hold true as well for military organizations. First efforts to determine the generalizability of SST for the U.S. Army began in 1982 with a set of interviews of general officers in the office of the Joint Chiefs of Staff of the D. S. Department of Defense. As a result of these efforts, Jaques determined that a rough correspondence exists between general officer grade levels and levels of complexity as specified in the SST model. In addition, rough time spans seemed to corroborate the levels of complexity as determined by the tasks inherent in positions whose incumbents were interviewed.

Two major additional pieces of work have been undertaken since that first exploratory effort. The first was a series of interviews of generals, lieutenant generals, and corresponding members of the senior executive service. From this series of interviews, an interview data base was developed from which was identified performance requirements by level at what corresponded to Strata VII and VI for general officers, and VI and V for SES. In addition, time span measurements confirmed the parallel between these levels and corresponding levels in the private sectors, i.e., confirmed the apparent generalizability of SST at these levels to the military organization. After that data base had been analyzed, an additional data base was established with major generals and brigadier generals, hypothesized to fall at Strata V and high IV respectively.

In the remainder of this chapter, these efforts will be reviewed and their implications for military organization and leadership will be explicated. In broad overview, research thus far in the D.S. Army suggests very strongly that SST is quite applicable to military organizations. (This also would suggest that SST principles are broadly generalizable to all large scale organizations.) An understanding of the relationship between the SST description of progression in complexity of organizational performance requirements and the growth of adult cognitive capacity has strong implications for the selection and development of leaders in the military.

#### **OJCS Research**

In the work leading to publication of *A General Theory of Bureaucracy,* private sector civilian managers at Strata VI and VII (the level of corporate offices in large-scale organizations) had been found to have perspectives substantially broader than those typically found at the highest levels of strategic business units. These higher level position incumbents had a wide range of associates in other organizations with whom they networked. They were also broadly interested in political, economic, sociological, technological, and informational issues and took factors from these broad dimensions into account when assessing future directions that their organizations ought to pursue; equally, they sought to develop and exercise influence in these and other areas as a means of conditioning external environments to enable more effective operation of their strategic business units.

The research within the office of the Joint Chiefs of Staff (OJCS) had two broad objectives. One was to determine through position incumbent interviews whether the office of the Joint Chiefs could be mapped with SST. That is, given the various rank levels to be found there, would the successively increasing responsibilities associated with those ranks map against the Strata as defined by successively increasing complexity of Strata in private sector organizations? The second objective was to use SST as a lens to identify organizational malfunctions that might be

correctable.

#### **General Officer Interviews in OJCS**

Thirty-two flag rank officers were interviewed. Two or more discussions were held with many of them. Interviews focused on their work as they saw it, their perception of the functioning of the office of the Joint Chiefs, and certain specifics reflecting critical postulates of SST.

Time-span measurement is a critical construct. It had been decided in advance that the interviews should test the assumption that there would be a consistent structure of organization command levels related to the time-frame within which people worked. Time frame (or time span) has been found to correlate in civilian organizations quite highly with felt weight of responsibility of position. It seemed necessary that a similar finding exist in military organizations if the assumption of generalizability of SST to military organizations was to be confirmed. The critical issue in the DJCS investigation was whether there would be a consistent increase in time span at the higher organization levels, approximating what had been found in civilian organization.

Command Level	Time Span	Main Range	Comparable Civilian
4-Star	20+ Years	20-25 Years	Large-scale Corporate Chairman and CEOs
3-Star	10-19 Years	12-15 Years	Corporate VPs and EVPs
2-Star	5-9 Years	6-8 Years	Subsidiary CEOs
1-Star	2-4 Years	3-4 Years	General Management

#### Table 1: Time Spans-OJCS Interviews

Time-span measurement was accomplished with 25 of the 32 officers. The time spans obtained in these interviews ranged from 2 years to 15. Jaques (1983) concluded that there is clear evidence of organizational cut off points at 2 years, 5 years, 10 years, and 20 years, giving a series of discreet organizational levels as shown in Table 1. These correspond to findings previously obtained in private sector industry. Jaques noted that there were four cases in which the time-span measure indicated a position at a higher level than its established rank would indicate, in all cases the incumbents having been aware of a sense of reduced effectiveness because of under-recognition of role. Conversely, there were three cases in which the time-span measure indicated responsibilities below the established level of the position, in each case the individual feeling under-employed in an over-rated role.

As Table 1 indicates, there was a general systematic progression of time-span of role, corresponding to grade level of position. This suggests that, over time, the system had by trial and error adjusted itself so that grades and responsibilities were generally balanced. There was a specific and progressive level of complexity in job responsibilities. Brigadier Generals typically were overseeing implementation of established programs and were frequently found to be involved in exploration of possible alternative systems for accomplishing those programs. At the

major general level, the focus of responsibilities was largely defined by the Planning, Programming, Budgeting, Execution System (PPBES) cycle, which Jaques described as working at the outer limit (6-8 years) of concretely specifiable work programs.

Work at the lieutenant general level was substantially more "conceptual" in nature, consistently identified as having a time horizon of 12 years or more. As Jaques described it, at that level objectives can be specified, most of the knowledge exists for reaching the objectives, but the design or specific program cannot yet quite be put together because of residual political, economic, social, or technical uncertainties which must be resolved before a 6-8 year concrete implementation program can be established. Jaques further noted that at time-spans beyond 10 years, there was general recognition that these broader intangibles needed to be addressed in order for specific programs to be formulated.

Another consistent function of the lieutenant generals in OICS was to act as a buffer or shock absorber for subordinate levels, in order to screen out "environmental noise", and to provide a "quasi-stable situation" in which 6-8 year implementation plans could be stabilized and executed.

The OICS interviews contained no full generals (4-star). However, there was evidence from some of the other interviews concerning time-spans at the four-star level, which suggested the greater-than-20-years value shown in Table 1. These other interviewees described the four-star work as that of setting the strategic working orientation within which the 12-year programs and the 6-8 year implementation plans could be organized. The strategic orientation of the more senior generals served as a set of working assumptions for the development of programs and plans, enabling those programs and plans to be fitted into the larger context of governmental working assumptions about world political, economic, and social developments, while taking into account the most reasonable assumptions about new technology.

The value of SST as a lens for examining the work of an organization, together with the work of its position incumbents, is illustrated by several additional findings from the research. One of the reasons why a time horizon of more than 20 years is required at the top of large scale organizations is that, by and large, such organizations inevitably must plan for large capital outlays for major acquisitions. Such outlays are "zero sum." That is, the opportunity cost of any given strategic procurement is generally high. Competing alternatives generally become fiscally impossible for years or even decades. One way the topmost strata of large organizations "add value" is through strategic vision-long-time-horizon understanding which gives purpose to more-near-term actions, and which reduces the likelihood of intolerable opportunity costs. In this respect, the Department of Defense is little different from a major multinational corporation.

Jaques searched for evidence of this strategic outlook within the OICS, but did not find it. He noted that the longest-time horizon plans at OICS level did not appear to encompass the long-time-frame capital and R&D plans of the separate services. He noted that the result was a real downward compression of everyone's level of work and that the lack of an encompassing frame of reference from OICS probably contributes to "... some of the so-called turf battles between services. ...". He concluded that inter-services collaboration probably could be fully effective only in the context of 20-25 year programs which could be focused and directed from OICS

level. In this regard, the Department of Defense is again no different from other large scale organizations.

The specific findings are probably not more important than the fact that they show (a) a generalizability of SST from private sector corporations to the defense establishment, and (b) the effectiveness of SST in providing a lens for viewing organization design and functioning to enable identification of *missing* elements (such as the encompassing long range vision from the top) that otherwise might not be noticed. It thus constitutes a very powerful tool for improving organizational design and functioning.

#### **Army Senior Leadership Interviews**

The interviews conducted within the Office of the Joint Chiefs of Staff provided substantial evidence that SST principles probably apply equally as well to military organizations as to private sector organizations. Given this initial confirmation, a substantially larger series of interviews was planned, the sample to include 4-star generals, 3-star generals, and equivalent members of the Senior Executive Service, both career and appointed. This study had two specific purposes. The first was to continue testing the generalizability of SST to military organizations. The second was to develop a considerably larger data base of position incumbents at Strata VI and V, and to learn considerably more about the nature of work at those levels.

Previous SST research had developed a substantial data base of private sector managers up to and including Stratum V, but the number of known exemplars at Strata VI and VII on whom actual research findings had been obtained was relatively small. The interview study thus was focused on individuals known to be occupying positions that theoretically were either Stratum VI or Stratum V positions. (The assumption here, based on the work within the OJCS, was that most 4-star general officer positions would be Stratum VII and most 3-star general officer positions would be Stratum VI.) This would produce a substantial amount of new information about the actual responsibilities, attributes, and cognitive power of a much larger number of position incumbents at these levels.

A total of 68 Army executives, military and civilian, were interviewed. As noted above, the military positions were those of lieutenant generals and generals. Civilian positions were thought initially to be equivalent, but were found later probably not to be. In all cases but one, an interview team conducted an in-depth interview which the executive permitted to be tape-recorded. The tape recorded interviews were transcribed verbatim and then were subjected to an extensive content analysis from which the findings were drawn.

The content analysis was focused primarily on developing an understanding of the nature of work and frames of reference at the 3-star, 4-star, and SES levels, together with critical knowledge and skills, and other abilities required at these levels of work. However, an additional concern was to obtain from incumbents an assessment of the effectiveness of the developmental processes by which they had to come to the positions they occupied, together for suggestions for changes in that process that might improve the development of senior officers. And, as was noted above, it was felt important to test SST further, with the

understanding that if its generalizability continued to be supported, the theory itself would powerfully enable further work both to facilitate executive development and to provide information on decision system support for executives.

	3-Star (N=33)	4-Star (N=8)
Multinational	60.6	87.5
Joint/Unified	54.5	75.0
Total Army	42.4	37.5
Consensus Building	87.9	87.5
Vision/ Anticipating	63.6	87.5

 Table 2: Requisite Knowledge and Skill Base 3- and 4- Star Positions

	Combined (N=41)
Abstract Thinking	34.1
Climate Setting	24.4
Self-Evaluation	24.4
Sharing Reference Frame	17.1

#### Table 3: Requisite Knowledge and Skill Base 3- and 4- Star Positions Combined

The major findings from the content analysis are shown in Tables 2 and 3. The 4-star and 3-star general officers in this sample were very similar to those found in the Office of the Joint Chiefs. While it is possible to be fairly well insulated against the reality of joint service operations at lower levels of command, such insulation is difficult at the 3star level and impossible at the 4-star level. The general officers in this sample strongly emphasized the need for perspectives on other services and for how to operate effectively with members of the other services.

They also were interested in the broad scope of the political, economic, sociological, technological, and intellectual world as much as were their private sector counterparts. They recognized that anything which might be occurring anywhere in any of these facets might be of significance for their work and for the effective functioning of subordinate commands. Their networks were large in scope, as had been the case with private sector managers. The 4-star networks were generally larger than those maintained by 3-star general officers, and those were generally larger than those maintained by members of the SES. Especially at 4-star levels, the networks included both national and international political figures with whom senior officers interacted, to include in some cases heads of state, ambassadors, senators and congressmen, governors, NATO officials, international negotiators, and ranking State Department Officials. To be effective in the performance of their duties, these senior generals of necessity had to have learned to be at ease in discussions and negotiations with such public figures in the performance of duty and during state occasions. The requirement for negotiation at ease equally applied to those occasions when these senior officers were required to represent the national interests of the United States in both military and non-military matters.

The international perspective required for effectiveness at these levels is paralleled by a similar requirement for national political work in negotiations with the Congress, with national and state political leaders, with the press and with television, and with other leaders of political and social opinion who influence attitudes toward the military. This required a sense of how these political leaders think, the kinds of arguments likely to influence them, and the pressures to which they themselves are subjected by their constituents or by their perceptions of public attitudes.

This kind of understanding, in turn, required that these senior generals have a deep understanding of American society and culture, including sub-cultures and values of its key groups. This understanding is crucial for effective leadership, and for the capability to undertake the indirect influence actions required from their levels.

Evidence for the developmental processes postulated at these levels by SST is also apparent in Table 2. In theory, Stratum V incumbents are concerned about leading and managing organizations at the level of a strategic business unit. (In the Army, the equivalent is a Division.) Thus, their focus is downward, and their concern is piloting a complex but bounded system in competition with other bounded entities. The focus of a Stratum VII leader is much more outward toward the broad environment within which his larger organization functions. If a developmental process is operating, the Stratum VI leader should have a focus intermediate between these two, and that is exactly what is found. Though the number of 4-star respondents was too small for reliable statistical comparison with the 3-star sample, the relatively broader focus is apparent from the first three topic areas.

	3-Star (N=33)	4-Star (N=8)
1-5 Years	5	0
5-8 Years	7	2
10 Years	8	2
10-15 Years	6	0
15-20 Years	5	0
20+ Years	5	4

#### Table 4: Stated Time Span of Work 3- and 4- Star Positions

Time horizon also differentiates 3-star and 4-star interviewees, and more or less confirms SST postulates concerning time horizon by Stratum. Table 2 shows a higher percentage of 4-star comments on vision/anticipating, and Table 4 shows time horizon data. Three things are apparent from Table 4.

*First,* there is a wide range of individual differences in time span, and many incumbents fall below the time spans postulated by SST. This may be due to differences in the way time span data were obtained in this research, to differences in the complexity of jobs (such that some were over-graded, some under-graded, and some appropriately graded in relation to rank of incumbent), or to capacity of the incumbents.

**Second**, there is a clear difference in the time span distributions of the 3- and 4star generals, though the number of cases is too small to permit reliable statistical analysis. The more senior

generals have substantially longer time spans, half of them being of 20 years or more.

*Third,* the median value for the time span is essentially the time span predicted on the basis of SST findings in the private sector.

#### **Discussion and Implications**

In summary, findings from interview content analysis of Army general officers show 3 and 4-star incumbents to have frames of reference, duties, and time spans much like those predicted by SST, based on findings from the private sector. This strongly suggests some or all of three conclusions. The first is that SST is broadly generalizable to a very wide range of organizations. The second is that military organizations clearly resemble nonmilitary organizations in many respects. The third is that organizations in general, at least in the environments thus far addressed by SST, experience similar kinds of systems forces and factors with survival value, so that they generally trend toward some kind of "good" form.

These findings are of considerable importance. Confirmation of the generalizability of SST to the executive levels of the D.S. military establishment adds strength to the thesis that formal organizations (bureaucracies) are in general responsive to the same kinds of systems forces. One of the key assumptions in SST is that, in a requisitely structured organization, each stratum will "add value" to each adjacent stratum. Organizational theorists have for many years recognized broad divisions of labor (e.g., Simon, 1977) within large scale formal organizations. Simon's description is that of a three-layer cake:

In the bottom layer we have the basic work processes-in a manufacturing organization, the processes that procure raw materials, manufacture the physical product, warehouse it, and ship it. In the middle layer we have the programmed decision-making processes-the processes that govern the day-to-day operation of the manufacturing and distribution system. In the top layer, we have the non-programmed decision-making processes, the processes that are required to design and redesign the entire system, to provide it with its basic goals and objectives, and to monitor its performance. (110)

The "value added" is then implicit in a requisitely structured organization. At the top, incumbents "scout" the environment, obtain intelligence valuable to future operations (Kotter, 1982), and develop resourcing of various kinds essential to future operational effectiveness. These resources include not only financing, but also political and public goodwill based on the image projected both by the organization under the executive's leadership and by the executive himself. Thus, the total role of the executive (Mintzberg, 1973) includes external representation as well as internal control and coordination of the enterprise. It also includes actions to shape public opinion about the corporation – beyond public opinion about the executive himself. Public service roles for private sector executives are a means of accomplishing these ends. It is noteworthy that the executive members of the Armed Forces are no less sensitive to these issues.

Implicit in SST is the understanding that a part of the total role of executives and managers at all levels is definition of missions, goals and desired future directions, together with the explicit

formulation of ways and means of achieving them. At the top, these formulations are very broad, as is fitting considering the scope and scale of frames of reference at the top, and the very long time frames over which actions occur. Formulations become more explicit at successively lower levels. The bounds of the formal organization – in terms of the number of strata it encompasses – are then determined by the complexity of the organization at the top, the complexity of work that must be accomplished by the output stratum, and the number of levels required to translate the top-level complexity into the specificity that will produce a rational environment (Thompson, 1967) for bottom-level production.

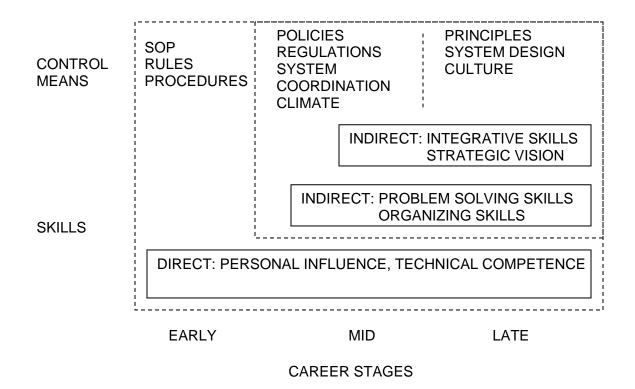
As the number of levels in a formal organization increase, responsiveness decreases because of the increased time required for information to span the required number of organizational levels. Costs increase both by virtue of redundant work in systems with too many layers, and by virtue of wasted production man-hours when decisions were needed but could not be obtained because of information transit time requirements. System forces toward the optimum number of levels would in theory then exist when resources become scarce, as a result of competition from other organizations or loss of market share for any of a variety of other reasons. A system force against the optimum number of levels would be the established constituencies – the power holders – within the organization. These competing forces, among others, then are responsible for the observed number of strata observed in formal organizations. Lacking a theoretical model of requisite organization, layering increases in times of prosperity and decreases – or the organization dies – in times of hardship. One of the extraordinary contributions of SST is its potential as the required theoretical model in times of prosperity, to enable organizations to avoid the growth of excessive layers which will become a millstone as resources decline.

Figure 1 shows general performance requirements by organizational level as derived from SST and superimposed on the Army TOE (operational unit) command levels. It is highly significant that this system of TOE levels has been maintained for decades, while TDA (headquarters, staff, non-operational) organizations typically have many more layers. It is inviting to conclude that the acid test of TOE unit effectiveness - survival in war - is sufficiently compelling that "layering" is not permitted by those who remember (or rehearse) war. For those military organizations that will never see war, no such test exists, and the system force that would preclude excessive layering does not exist. SST could provide the rational basis for appropriate design for those organizations. The war-tested model appears to conform to SST requisite design so closely that it is almost startling.

Strat um	Time Span	General Task Requirements	Toe Grade	Domain
VII	20+ yrs	Creates complex systems organizes acquisition of major resources; creates policy	General Army	Systems strategic
VI	10+ yrs	Oversees operation of subordinate systems; applies policy	Lt Gen Corps	_
V	5+ yrs	Direct complex systems	Maj Gen Division	General command

<u>IV</u>	2+ yrs	Tailor resource allocations to interdependent subordinate programs or units	Brig Gen Col Brigade	
III 1+ yrs	Develop and execute plans to implement policy/ missions	Lt Col	Direct	
		Battalion	command	
<u>II</u>	3+ mos	Direct performance of work; anticipate/solve current problems	Cpt Lt Company	
I	less than 3mos	Hands-on work performance, use practical judgment to solve ongoing problems	NCO/SM	

Figure 1: General Performance Requirements by Organizational Level



#### Figure 2: Strategic Leadership Developmental Sequence

SST also provides a remarkable template for designing an effective system for executive development. Given the progressive growth in complexity across strata, shown in Figure 1, a rational model of organizational control means that the required executive skills emerge, as shown in Figure 2. The means used to control organizational action must vary from top to bottom, by the law of requisite variety conforming to the scope and scale of what is controlled. At the very top, executives articulate the broad principles of operation which must govern how "business is done." In addition, executives are responsible for the design principles governing the way subordinate strategic business units are established and grown. These broad principles establish the basis for the emergence of the organizational culture.

A similar process exists at mid-levels, the primary difference being the greater specificity and certainty associated with managerial actions and decisions. Based on articulations from the executive level, mid-level managers at the level of the strategic business unit develop operating policy, and regulations by which the organization will function. They also focus on coordinating and resourcing their" departments" in view of missions and goals assigned. Finally, at the bottom (the production "layer"), the midlevel articulations are converted into standing operating procedures and rules which generate the actual production processes.

By inference, the progression of managerial skills necessary at each of these broad organizational "layers" can also be derived. Cognitive scientists (e.g., Streufert & Swezey, 1986) postulate individual differences in cognitive complexity. Streufert's classification is hierarchical, unidimensional at the lowest level, multidimensional differentiation at a higher level, and multidimensional integration at a still higher level. The notion is that multidimensionality is more complex than unidimensionality, and that integration is more complex than differentiation. If one adds the dimensional integration can be postulated. The requirement for complexity increases by Stratum. In theory, managers either develop or already have the required complexity, or they fail.

SST postulates "growth tracks" (modes) along which managers progress, developing greater "cognitive power" in varying degrees. Stamp (1988) provides highly convincing evidence that growth in cognitive power is crucial for managerial progression, reporting correlations ranging from .7 to .9 between predictions based on cognitive power assessment and level of managerial responsibility achieved. It seems likely that this growth may also reflect progression along the concrete-unidimensional to abstract-multidimensional integrator dimension as well, and perhaps that shown at the bottom in Figure 2.

The unique contribution of SST is in the understanding of individual differences in growth rates. Many organizations have "lock step" development programs. Most managers are expected to grow at a given rate or fall off the "fast track." A better system for developing and using human resources, which may become more scarce, is to fit the development system to the rate of progression the individual is capable of sustaining. SST provides a means for doing this.

#### Summary

This chapter has provided some recent findings from research on general officers within the U.S. Army and Department of Defense. These findings show strong support for Stratified Systems Theory, and for the conclusion that SST predictions generalize to the U.S. military organizations studied. Implications for organizational design and executive development were discussed.

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