DRIVERS OF ORGANIZATIONAL RESPONSIVENESS

EXPERIENCES OF A MILITARY CRISIS RESPONSE ORGANIZATION

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Abstract: The topic of organizational responsiveness – where organizations need to flexibly react to strategic and operational demands simultaneously – has been under-explored in strategic management research. Our study was initiated to shed more light on this topic, primarily by studying an organization specifically designed to handle crises. By definition, crisis response organizations have to be prepared to react to unpredictable events. Moreover, the volatility of the crisis situation itself requires a high degree of flexibility to get or keep the situation under control. The study hypothesizes modular organizing and organizational sensing to be key drivers of organizational responsiveness. Empirically, we examine the effect these two variables have on the responsiveness of the Netherlands armed forces for crisis response deployment. Findings indicate that modular organizing and organizational sensing are drivers of responsiveness. In addition, our study uncovered the importance of an organization's level of system decomposition to responsiveness. A high degree of system granularity can lead to a predominantly inward focus whereas organizational responsiveness calls for a strong external orientation.

Keywords: Organizational responsiveness; crisis response; organization design; modularity

The reality of today's turbulent organizational environments is that most organizations have to deal simultaneously with the "here and now" and the future, and they should be capable of combining routine behavior with improvisation (Winter, 2003). Organizational responsiveness thus has both strategic and operational aspects. Our study examines two hypothesized antecedents of organizational responsiveness: organizational sensing and modular organizing. We define *sensing* as an organization's ability to fathom its complex relationship with the outside world. The sensing process consists of three distinct stages: noticing, interpreting, and acting (Daft & Weick, 1984; Kiesler & Sproull, 1982). Huber (2004) argues that organizational responsiveness depends on the cumulative sensing effort of all organizational members. *Modular organizing* is defined as the combination of autonomous organizational units into customized constellations (Sanchez, 2003; Schilling, 2000; Worren, Moore, & Cardona, 2002). Sanchez and Collins (2001) explain that the key merit of modularization is to increase organizational flexibility without jeopardizing performance.

To investigate organizational responsiveness, our study draws upon the crisis-response experiences of the Netherlands armed forces. It uses the expeditionary crisis-response task setting of many of today's Western armed forces as a metaphor for organizations confronted with environmental turbulence. Almost all expeditionary crisis-response operations are unique endeavors but are conducted by similarly (modularly) organized task forces (de Waard & Kramer, 2008). Various armed forces have found modular design to be a useful organizational approach to react effectively to very different crisis situations. Moreover, a deployed military task force finds itself in a permanent state of operational flux. The volatility of most crisis situations has made organizational sensing – or, in military terms, achieving

continuous situational awareness (Alberts, Garstka, & Stein, 2000) – a critical success factor for repeatedly outsmarting the opponent and staying on top of the situation.

This line of reasoning leads to the research question that guided our study: What is the effect of organizational sensing and modular organizing on the responsiveness of the Netherlands armed forces? Our article is divided into five main parts. First, we present a theoretical model that shows relationships among sensing, modular organizing, and organizational responsiveness. Next, we describe our study's method which involved a large-scale survey carried out among 1,208 senior officers of the Netherlands armed forces. The third section presents our study's results, which show that modular organizing and organizational sensing are reinforcing drivers of responsiveness but that, in addition, the organization's level of system decomposition is an important factor to take into account. In the fourth section, we discuss our findings, including a comparison of the Netherlands, United States, and Australian armies to show how organizational size affects responsiveness. The final section is the conclusion.

THEORETICAL MODEL

The study is based on the theoretical model shown in Figure 1. Modular organizing (MO) is the independent variable, organizational sensing (OS) is the mediator variable, and responsiveness (R) is the dependent variable. Relationships among these broad variables are based on three theoretical arguments. First, because of the growing belief that strategic maneuvering and operational performance are intertwined, sensing has become a key capability associated with organizational responsiveness (Doz & Kosonen, 2008, 2010). An implicit assumption is that organizations should try to create a culture in which all members are challenged to proactively scan and interpret their immediate environment (Cohen & Levinthal, 1990; Lane, Koka, & Pathak, 2006; Todorova & Durisin, 2007). More specifically, Huber (2004: 57) states: "In tomorrow's business environment, where sources of change will be less anticipatable than in the past, eclectic responsibility will be needed to complement the practice of assigning specialized personnel to monitor and report on particular environmental components. Without eclectic responsibility, many unanticipated threats and opportunities would go unnoticed because no specialized sensor had been assigned to the source."
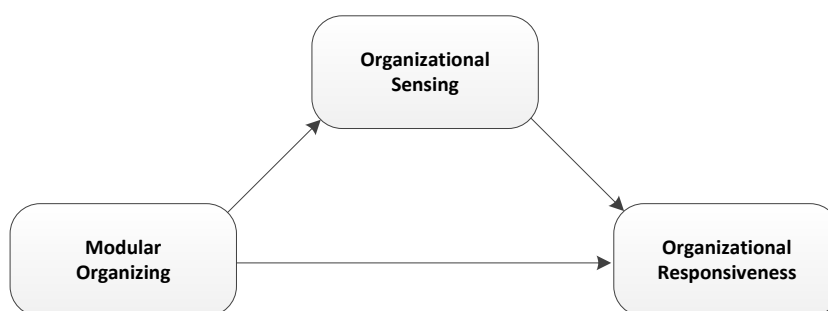

Fig. 1. Research Model

Second, modular organizing is a design strategy that facilitates strategic as well as structural and operational responsiveness. From a strategic perspective, for example, modular organizing has stimulated the invention and application of new technologies, the development of new products, and the upgrading of existing products (Brusoni, 2005; Sanchez, 1995, 1996). Taking the structural responsiveness viewpoint makes it clear that modularity has offered organizations the ability to reorganize their internal production processes in such a way that economies of scale and scope can be achieved simultaneously (Anand & Daft, 2007; Brusoni & Prencipe, 2006; Schilling & Steensma, 2001). Looking through an operational lens shows that modularity's underlying principle of loose coupling creates an organizational system that can benefit from specific advantages, such as the localization of adaptation and trouble, and the reduction of coordination costs (Orton & Weick, 1990; Weick, 1976).

Third, our theoretical model also follows existing theory explicating that modular organizing plays a dual role. It is argued that modularity not only directly influences responsiveness, but

the mixing and matching of autonomous organizational units through standardized interfaces helps organizations to flexibly tap new sources of knowledge (Hansen, 1999). Moreover, due to the autonomous and specialized nature of modular components, the speed of problem solving increases at the same time. In this regard, Pil and Cohen (2006: 1001) state: "Since each component or subsystem maintains a consistent functional focus, developers may acquire cumulative experience with certain kinds of problems faster. This enables them to search for and evaluate alternative solutions more quickly."

METHOD

The study's empirical base is a large-sample survey. A questionnaire was distributed to a large group of military officers drawn from the Netherlands armed forces. This group consisted of majors, lieutenant colonels, and colonels from the three main services: Army, Navy, and Air Force. The sampling frame concentrated on the middle and higher echelons as the research required respondents who have significant military experience and knowledge as well as potential insight into various strategic and organizational aspects of the Netherlands armed forces. The study's main objective was to gain an understanding of the way in which modular organizing and organizational sensing supported the responsiveness of the Netherlands armed forces as a whole. Therefore, the questionnaire asked respondents to describe the armed forces collectively, despite their different service backgrounds. The questionnaire also contained room for open-ended remarks at the end.

The initial mailing consisted of 3,706 paper questionnaires sent to the officers' home addresses. Within five weeks, a total of 1,533 officers filled out and returned the questionnaire by mail. Because of the high percentage of returned questionnaires, no reminders were sent to increase the response rate. We cleaned the dataset by removing questionnaires with missing values on the model or control variables. Questionnaires from respondents without actual mission experience were also disregarded. Altogether, 1,208 usable questionnaires remained, resulting in a response rate of 33 percent. An overall profile of the respondents is shown in Table 1. Preliminary statistics as well as instrument and construct validation details can be found in the Appendix.

Table 1. Research sample

| Respondents		Number of Operational Deployments						
		1	2	3	4	5	Subtotal	
Army	Major	138	132	59	25	16	370	676
	Lt. Col.	118	78	40	14	8	258	
	Col.	26	16	4	2	0	48	
Air Force	Major	76	49	20	12	12	169	296
	Lt. Col.	43	31	20	3	4	101	
	Col.	14	8	2	1	1	26	
Navy	Major	43	29	31	11	8	122	236
	Lt. Col.	31	32	14	5	3	85	
	Col.	13	8	3	4	1	29	
	Total	502	383	193	77	53	1208	

RESULTS

Table 2 presents the results of the hierarchical regression analysis, in which modular organizing (MO) and organizational sensing (OS) are entered in Model 2 as predictor variables of the organization's responsiveness (R). The results show that MO (β = .32) and OS (β = .31) significantly and equally contribute to responsiveness (R). Moreover, the adjusted R^2 of .29 indicates that the proportion of variance explained by these two variables is considerable.

Table 2. Hierarchical regression of variables predicting organizational responsiveness

	Model 1				Model 2			
	B	SE B	β	ΔR2	B	SE B	β	ΔR2
Constant	3.56	.04			1.76	.10		
Control variables:								
Dummy Service 1	.02	.03	.02		.00	.02	-.00	
Dummy Service 2	-.03	.03	-.03		-.05	.03	-.06	
Dummy Rank 1	-.16	.04	-.22***		-.09	.03	-.12*	
Dummy Rank 2	-.12	.04	-.15	.02	-.06	.04	-.08	
Predictor variables:								
Modular organizing					.33	.03	.32***	
Organizational sensing					.20	.02	.31***	.28
df				1203				1201
Adjusted R²				.01				.29

*p < .05   **p < .01   ***p < .001

Regarding the hypothesized mediation effect of organizational sensing, there was a significant relationship between the independent variable (modular organizing) and the dependent variable (responsiveness) (β = .46, p = .000) that declined after controlling for the mediator (β = .33, p = .000). To confirm a significant decline in this relationship, a separate Sobel mediation test (Baron & Kenny, 1985) was performed, resulting in confirmation. Figure 2 schematically presents the outcome of these analyses.
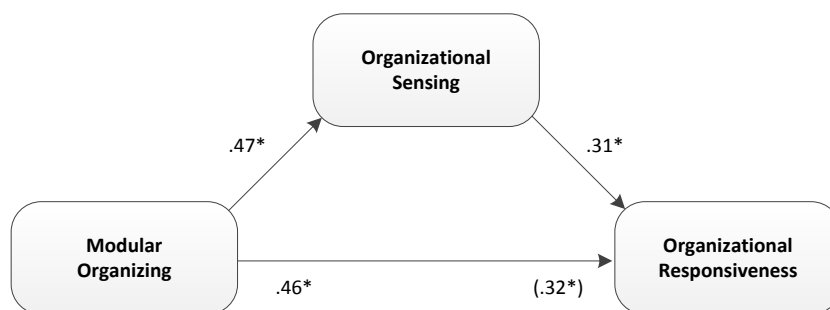
*p < .05

Fig. 2. Research Model Outcomes

Note: Numbers shown are the standardized regression coefficients for the relationship between modular organizing and the Netherlands armed forces' responsiveness as mediated by organizational sensing. The standardized regression coefficient between modular organizing and responsiveness, controlling for organizational sensing, is in parentheses.

In general, the statistical outcomes corroborate earlier research findings on the crisis response performance of the Netherlands armed forces, indicating that intra- and inter-organizational collaboration has become a necessity for effectively dealing with the complexity of international crisis-response situations (de Waard, Volberda, & Soeters, 2012). Most missions seek resolution of a complex mix of military, diplomatic, economic, and humanitarian problems. Under such circumstances of causal ambiguity, no single actor can provide a complete solution. Progress can only be made when military and non-military partners work together, sharing their knowledge and generating new ideas. Working in different multinational, multi-service, multi-actor task forces has increased the armed forces organization's learning ability. Moreover, the cooperation that takes place among different individuals and organizational groups, over a long period of time and under extreme circumstances, deepens understanding of each other's ways of doing things. Not only is new

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knowledge acquired, but insights may be obtained that allow new knowledge to be translated into concrete, usable routines and processes. New knowledge and insights can then be used to improve the tactics and techniques of a running mission as well as missions to come. On the whole, the strong influence of modular organizing and organizational sensing is based on the fact that they appear to reinforce each other. Essentially, a positive feedback loop develops where learning outcomes can be applied in new settings and constellations, leading to new insights that can be applied, and so on.

The regression analysis also revealed a significant effect of dummy variable Rank 1. This control variable measures the difference in scores between colonels and majors. The result in Model 2 of -.12 means that majors assessed the Netherlands armed forces' responsiveness significantly less positive than colonels. The other control variable (service background) did not show any statistically significant differences between the three services, despite the earlier ANOVA indicating otherwise. A possible explanation for the divergent opinions of majors and colonels can be found in the level of operational experience shown in Table 1. Majors constitute a highly experienced group in comparison to colonels. Even more interesting is that many of the critical remarks, made in the open question at the end of the survey, come mainly from experienced officers. A total of 39 remarks were made that relate to relationships among modular organizing, organizational sensing, and responsiveness. Those remarks point in three directions.

A first group of 19 respondents argues that the Netherlands armed forces "keeps reinventing the wheel" and does not truly learn from past experiences. A second group of 16 respondents links the problem to imperfect modularization. Their remarks refer to the organization's permanent structure not being aligned with its crisis-response role. Since a tailor-made configuration is required for each mission, the process of mixing and matching to create an ad hoc organization cuts through existing hierarchical and functional boundaries. As a result, the tailor-made military formations that are deployed sometimes have to deal with the problem of unfamiliarity. The fact that a task force is formed on an ad hoc project basis, with very specific operational assignments, can lead to situations in which units and individuals have to work together closely without knowing each other very well. Despite extra training programs, these ad hoc units seldom reach the level of operational responsiveness of standing units. Moreover, when a mission ends the units return to their original positions in the permanent organization, making it difficult to close the organizational learning cycle. A third group of only four respondents complains about the fact that the mixing and matching strategy leads to an overemphasis on task generalization. Concrete examples that were mentioned vary from Navy and Air Force personnel having to conduct infantry-like tasks to soldiers in general being deployed as surrogate aid workers or policemen.

In general, the open-ended remarks show that affinity with either the operational or the organizational/strategic level determines the assessment of the organization's responsiveness. Majors, who have a strong connection with the organization's operational-level task execution, refer more strongly to the negative, practical consequences of certain strategic-level decisions. Colonels, on the other hand, are at a higher organizational level and have a better understanding of the complex mixture of factors influencing a strategic decision. They may take for granted that "perfect" design decisions do not exist and that tricky operational consequences are just part of the crisis-response process.

DISCUSSION AND IMPLICATIONS

Overall, our study relates to the traditional organization design dilemma of differentiation and integration (Lawrence & Lorsch, 1967). Existing theory says that successful modular organizational systems thrive on the differentiation principles of near-decomposability and loose coupling (Sanchez & Mahoney, 1996). This is where the Netherlands armed forces encounter many of their organizational problems. The unpredictability and diversity of the current security environment make it difficult for the military crisis-response organizations (especially the Army) to create independent operational units within the parent organization that are capable of covering the wide array of crisis-response situations they may encounter. Embracing a modular strategy of delivering customized solutions has forced the Netherlands

armed forces to spend extra time and energy on integration mechanisms, such as joint exercises and training programs, to enhance coordination and unit cohesion.

Effects of Size on Responsiveness

The Netherlands Army is not alone in this challenge. Most Western armies with expeditionary crisis-response ambitions are confronted with the same differentiation and integration issues. Evidence from this broader field indicates that the size of the organization is an important contingency factor influencing organizational responsiveness. Table 3 summarizes the main relationships among organizational size, structure, and responsiveness across the Netherlands, Australian, and U.S. armies.

Table 3. Organizational size, structure, and responsiveness

	U.S. Army	**Australian Army**	**Netherlands Army**
Organizational Size	Large	Medium	Small
Permanent Structure	Specialized brigades	Multi-functional brigades	Specialized brigades
Deployment Structure	Specialized brigades	Fixed task forces	Customized task forces
Strategic Responsiveness	High	High	Medium
Structural Responsiveness	High	Medium	High
Operational Responsiveness	High	High	Medium

All Western land forces are hierarchically divided into standard subunits. The grouping of these organizations is divisional (Mintzberg, 1983), which means that the structure is constructed from a number of "smaller armies" of different sizes. To be precise, a military division consists of several brigades. A brigade, in turn, can be subdivided into battalions, and a battalion can be split up into companies. The smaller the building-block unit becomes, the smaller its maneuver, combat support, combat service support, and command elements will be. A brigade is perceived to be the smallest organizational building block that has a sufficient combination of functional elements to conduct military operations autonomously for a lengthy period of time. Thus, a brigade complies with modularity theory's rule of near-decomposability (Bonin & Crisco, 2004). Yet for a small country such as the Netherlands, a brigade is a rather large organization. The entire Netherlands Army consists of only two mechanized brigades, with two mechanized infantry battalions and one tank battalion as its operational core, and one air maneuver brigade made up of three light infantry battalions. Deploying a single brigade for each crisis-response mission would place too heavy a burden on the organization. Moreover, the specialized nature of these brigades – mechanized or light/heavy – makes them less useful to cover the entire spectrum of tasks. Therefore, the Netherlands Army has abandoned the brigade as its main deployment structure. When a crisis situation occurs, the different functional elements that are needed are picked from the parent organization and merged into a temporary battalion-size task force. To perform the required operational tasks, the functional units (e.g., infantry, artillery, close air support, engineers) are structurally dependent on one another and need tight rather than loose coupling.

Given its organizational approach, the Netherlands Army seems to focus on structural responsiveness. It offers the organization the potential to structurally adapt to different types of crisis-response situations. To a certain extent it also enhances strategic responsiveness because the fine-grained selection and grouping process makes it possible to execute tasks that reach beyond the limits of traditional military formations and doctrine. Having said that, strategic responsiveness is also influenced in negative ways. First, the mixing and matching strategy hinders the high-readiness, quick-response ambitions of the Netherlands armed forces, since a tailor-made task force cannot be deployed straightaway but needs to undergo additional training. Second, units that are not deployed are temporarily deprived of critical functional elements. As a result, they do not get the opportunity to train to their full potential, making it difficult to lay a solid foundation for future military deployments.

Apart from these negative consequences for the organization's strategic responsiveness, operational responsiveness also suffers. It is questionable whether use of the integration mechanisms needed to transform the mixture of different functional elements into a smoothly

working system will ultimately lead to a sufficient level of organizational familiarity, meeting Weick & Roberts' (1993) idea of "heedful interrelating." To interrelate heedfully, a tight professional bond is necessary to sense problems before they occur or to immediately recognize deviations from normal routine.

Comparison to U.S. and Australian Armies

As one of the biggest armies in the world, the problem of a brigade being too large an organizational unit does not apply to the U.S. Army. Examining the design choices of the U.S. Army offers some additional insights into the relationship between system decomposition and organizational responsiveness. An interesting parallel with the Netherlands Army is that the U.S. Army has launched an initiative to transform into a brigade-centric permanent force. The rationale is that the traditional divisional structure is too focused on a large-scale, mechanized Cold War-type scenario whereas the brigade structure better fits the high-readiness, expeditionary, crisis-response situations found in today's world. The brigade structure is smaller and more rapidly deployable. Apart from the speed dimension, the brigade structure also facilitates strategic responsiveness in two other dimensions. First, it possesses an integral mixture of maneuver, combat support, combat service support, and command elements, which enables it to conduct a wide range of military tasks. Second, its organizational independence makes it possible to be picked from the standing organization without hampering the operational capacity of the organizational units that stay behind.

Another resemblance is the grouping of specialized brigades. Although the Netherlands Army makes a distinction between its light air maneuver brigade and two mechanized brigades, it does not have – in comparison to the U.S. Army – the numeric capacity to deploy these large units integrally. As described above, the Netherlands Army uses its standing organization as a pool of military capabilities from which units can be picked and grouped into temporary, customized task forces. Because of its size (42 active brigade combat teams (BCTs) and 28 national guard BCTs), the U.S. Army has the luxury to diversify into three distinct types of brigades that can be deployed as a whole: (1) infantry BCTs, (2) heavy BCTs, and (3) medium Stryker BCTs (Krepinevich, 2002). This subdivision provides the organization with a strong base of structural responsiveness because the BCTs are tailored in advance for specific terrain and operational conditions. Furthermore, operational responsiveness benefits from the balance between the basic structure and the deployment structure. Not only do the BCTs form the backbone of the permanent organization, they are also the standard unit of action for military operations. As a result, unlike the Netherlands customization approach, no extra integration mechanisms are needed when these BCTs are deployed. In a RAND report on the pros and cons of the U.S. Army's modular force structure (Johnson, Kitchens, Martin, & Fischbach, 2012: 12), one of the respondents hails the brigade-centric modular structure by saying that it helps "… to maximize unit cohesion through habitual association among combat, combat support, and combat service support units… creating relationships of mutual confidence and loyalty within companies, battalions, and brigades, which, in turn, make units more effective in combat."

Sitting in a middle position, when it comes to size and design choices, the Australian Army is an interesting organization to assess as well. Just like the U.S. and Netherlands armies, the Australian army has transformed from a divisional into a brigade-centric organization structure. However, in contrast to the other two armies, the Australian army has abandoned its structure of specialized brigades. Instead, multi-functional brigades have been formed that possess heavy as well as medium and light combat elements (Wainwright, 2004). The aim is to cover the entire spectrum of operations with a single type of brigade. However, although it is bigger in size than the Netherlands Army, the Australian Army encounters the same sustainability dilemma as the Netherlands Army; namely, the deployment of an entire brigade asks too much of the organization as a whole. To avoid the imbalance between the permanent and deployment structures – which the Netherlands Army has taken for granted – the Australians are now considering the possibility, based on past experience, of creating basic expeditionary task force structures within the brigade itself that possess the most likely combination of functional elements needed. With these "standardized" task forces, the

Australian Army aims to develop a new, smaller, unit of action at the battalion level that can be deployed integrally for the majority of its tasks (Hutcheson, 2003; Ryan, 2003). Moreover, the Australians believe that for very specialized or unique missions this basic structure can always be further customized with additional functionalities.

On the whole, one could say that the Australian deployment approach scores especially well on strategic and operational responsiveness. With respect to strategic responsiveness, both the brigade-size and the battalion-size units have a strong multi-functional character, which supports military deployment on two different organizational levels along a broad spectrum of operations. Regarding operational responsiveness, the key point is that creating a balance between the permanent and the deployment structure leads to units of action that have a high level of system integration and unit cohesion. A downside of the Australian approach is that forming multi-functional units inherently means making compromises regarding the number of, and the rationing of resources between, combat, combat support, combat service support, and command elements. Structural responsiveness might suffer because the standardized units are not primarily equipped to cover the extremes of the military operational spectrum.

Implications for Theory and Practice

Organizations that regularly use temporary inter-team project structures may benefit from the findings and insights of our study. Some research already exists on modularity and the dynamics of recombining organizational units (Helfat & Eisenhardt, 2004; Karim, 2006). Yet, these contributions focus on the aggregate, business-unit level. Generally speaking, business units have overall responsibility for a single product-market combination. Because of their autonomous position, business units are spared from all sorts of task-related external interdependencies and, therefore, seem to comply with modularity's basic rules of near-decomposability and loose coupling. However, many organizations increasingly rely on project-based temporary organizations to react quickly to changes in the environment (Kenis, Janowicz-Panjaitan, & Cambré, 2009). These intra- and inter-organizational cooperation structures are usually formed within the business unit structure, directly addressing the competitive frontline. Our study empirically confirms Van Heck and Vervest's (2007) view that in the contemporary context of project-based organizing in networks, the trade-off between strategic and operational responsiveness strongly depends on the level of system granularity. Extracting organizational elements from a parent organization and connecting them to other network partners works better when a modular structure exists. Such a structure is more responsive because "plug-and-play" speed will increase. In addition, network coordination requirements decrease, which makes it easier to focus managers' attention on strategic responsiveness rather than being busy with internal adjustment problems.

CONCLUSION

Our study introduces the level of system decomposition as an important factor influencing organizational responsiveness. Based on recent crisis-response experiences of the Netherlands Army, fine-grained modularization can lead to various and numerous task interdependencies, resulting in extra coordination mechanisms to integrate the different parts of the organization into a coherent system. Such interdependencies could result in managers developing a predominantly internal focus. Having said this, previous studies point out that organizations cannot do without task interdependencies, because points of interdependency are where relevant information and knowledge flow across organizational boundaries (Cummings, 2004; Jansen, Van den Bosch, & Volberda; 2005; Todorova & Durisin, 2007; Tsai, 2002). So it seems that striving for completely autonomous organizational structures is also questionable. Although the U.S. and Australian armies potentially have improved organizational responsiveness by creating modular structures based on the principle of near-decomposability, both armies should be aware of the risk of designing units that may become too independent and isolated. After all, one of the key merits of the fine-grained mixing and matching strategy of the Netherlands Army is that it has boosted the organization's ability to obtain knowledge and keep learning.

Thus, regarding modularity theory, an intriguing question arises: what does the word "near" in near-decomposability actually mean? To answer this question requires researchers to determine the maximum number of task interdependencies an organization can accommodate. Moreover, it could well be that the optimal number of task interdependencies varies across different industries, sectors, and geographic regions. Sorting out the limits of near-decomposability will help managers and designers to develop organizations that are able to respond effectively to crisis situations.

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APPENDIX

Methodological Details

A first concern was the possibility of common method bias in that all variables were measured with the same questionnaire. Harman's one-factor test was conducted to investigate whether or not bias was present. The unrotated principal component factor analysis, principal component analysis with varimax rotation, and principal axis analysis with varimax rotation all revealed the presence of multiple factors. The first of those factors accounted for only 18 percent of the total variance. Thus, no general factor became apparent, which suggests that potential problems associated with common method bias did not negatively influence the reliability of the research findings (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff & Organ, 1986).

Possible differences between early and late responders were also examined. For this purpose, each questionnaire was coded with the number of the week in which the questionnaire had been returned. An independent sample t-test showed no significant differences between groups one and five (for LC t(435) = .944, p >.05; for MO t(435) = .843, p <.05; for SF t(435) = .673, p >.05).

The sample was tested for representativeness by examining the distribution of the respondents over service and rank. There was a slight over-representation of Army respondents; therefore, an ANOVA was conducted to determine if significant differences occurred between these two categories on the model variables. This indeed proved to be the case. A post-hoc analysis (Hochberg) made clear that the Navy respondents scored significantly lower on modular organizing than the Air Force respondents. A second Hochberg analysis showed that colonels scored significantly higher than the majors and lieutenant colonels on all model variables. Based on these results, rank and service background were included as control variables.

Instrument and construct validation

Existing Likert-type scales were used to measure the variables organizational sensing (OS) and responsiveness (R). A new scale had to be developed to measure the variable modular organizing (MO) because no usable alternative was available (the measurement scales are presented below). Regarding the use of existing scales, a general point of concern was in how best to translate the individual scale items from a commercial context into a military crisis-response context. Some of these changes were relatively straightforward, such as substituting "team" for "unit." Other translations were more difficult. For example, the meaning of competitors, suppliers, and customers is clear in a business context. However, applying these terms in an international crisis-response setting that is politically driven would undoubtedly lead to problems of interpretation. To overcome such problems, experts with knowledge of both the business and military domains were consulted to help with the translation process. The resulting draft questionnaire was then discussed with a methodologist to get feedback on the nature of the questions and on wording issues. After revision, the draft questionnaire was pre-tested with a group of ten military experts from different services and officer ranks. Based on their comments about wording, layout, and length, the questionnaire was put in its final form.

To measure organizational sensing, Volberda's (1996) sensing scale was used. An exploratory factor analysis was conducted to validate the sensing construct within a military crisis-response context. Because the sample size exceeds 250, a combination of the Kaiser criterion and the scree plot was used to determine how many factors to extract from the factor analysis (Field, 2005). The analysis resulted in the extraction of a single factor for measuring organizational sensing. The variable received a satisfactory Cronbach's alpha score of 0.74.

The variable responsiveness was measured by merging Volberda's (1996) scales of operational, structural, and strategic flexibility into one scale. After running a factor analysis, again using the Kaiser criterion in combination with the scree plot, a single factor was extracted. This scale received a Cronbach's alpha score of 0.70. Despite the fact that this result is sufficient from a statistical point of view, it is considerably lower than the alpha of

Volberda's (1996) original scale. Translating the original scale items into a military crisis-response setting probably caused this deviation.

To measure modular organizing, a new scale was developed building on the earlier research of Sanchez and Mahoney (1996) and Worren, Moore, and Cardona (2002). In short, the main assumption of both studies was that a modular organization is built upon an architectural system capable of recombining organizational elements into tailor-made configurations. In order to make this architectural system work, organizations need organizational and technological interoperability. Organizational interoperability means that by using standardized interfaces such as standardized rules, procedures, and programs, a "plug-and-play" situation is created in which organizational modules can be put together, removed, replaced, and reconnected fairly easily. This same modular principle applies to the organization's technological resource base. To reach the desired plug-and-play end state, it is equally important for an organization to have compatible technological means. Moreover, looking at the human aspects, a modular organization needs people with a broad operational knowledge base and a cooperative mindset to enable it to function properly within different operational contexts and in varying organizational constellations.

A scale of 14 items, covering these various areas, was developed to measure modular organizing. Analyzing the scree plot resulted in the extraction of a single factor. Four items had factor loadings below 0.40. For theoretical reasons, however, they were retained. Specifically, items 8 and 9 had factor loadings of .31 and .35 respectively, but because they address the important aspect of organizational connectivity they had to remain part of the scale. Furthermore, items 1 (a loading of .36) and 3 (a loading of .37) were not dropped as they focus on the key issue of mixing and matching units into tailor-made organizational formations. Altogether, the modular organizing scale received a Cronbach's alpha score of 0.70.

Measurement scales

Modular Organizing (MO)	
1	To execute crisis response operations the Netherlands armed forces merge units, parts of units, and individuals into tailor-made formations.
2	The composition of Dutch crisis response formations depends primarily upon the task that has to be executed.
3	Dutch crisis response formations mostly participate in larger multinational task forces.
4	During crisis response operations the composition of a Dutch formation can be altered if the operational circumstances require this.
5	During crisis response operations standardized work processes, such as doctrines, SOPs, and drills make it possible to cooperate with units from other services and countries.
6	During crisis response operations our Dutch tailor-made formations rely on structured systems for planning and command & control.
7	During crisis response operations the division of work within our Dutch tailor-made formations is defined in detailed descriptions of jobs and tasks.
8	During crisis response operations everything in our Dutch tailor-made formations has been laid down in rules.
9	During crisis response operations consulting takes place between different organizational levels within the Netherlands armed forces.
10	Dutch servicemen and women master multiple tasks, SOPs, drills, skills, and techniques.
11	Dutch servicemen and women are up to date regarding technology and necessary know-how.
12	Dutch technological assets can be used for different types of missions and tasks.
13	The technological assets of the Netherlands armed forces are to a large extent compatible.
14	Dutch technological assets are to a large extent compatible with the equipment of partnering countries.

$\alpha = .70$ (for item 7 row)

	Organizational Sensing (OS)	
1	The Netherlands armed forces regularly analyze how partnering countries conduct crisis response operations.	
2	Armed forces from partnering countries have no major secrets for the Netherlands armed forces regarding their organizational strengths and weaknesses.	
3	The Netherlands armed forces systematically keep track of technological developments that could influence operational tasks and performance.	
4	The lessons learned during actual deployment are systematically being registered within the Netherlands armed forces.	α = .74
5	The lessons learned during actual deployment are systematically being internalized by the Netherlands armed forces.	
6	The Netherlands armed forces belong to the trend-setters in the international military sector.	

	Responsiveness (R)	
1	During crisis response operations our units can easily divide essential operational activities amongst each other.	
2	During crisis response operations our units can easily leave certain essential operational activities to units from other countries.	
3	During crisis response operations our units can easily adjust to changing operational circumstances.	
4	During crisis response operations our tailor-made formations possess a certain amount of slack that can be used to handle fluctuating operational demands.	
5	Whatever Service our units belong to, they cooperate easily with one another during crisis response operations.	
6	During crisis response operations our units cooperate easily with units from other countries.	
7	Our organization has the capacity to easily shift functions and tasks in case a crisis response operation requires this.	α = .70
8	Our servicemen and women can easily take on alternative roles and tasks in case a crisis response operation requires this.	
9	From its permanent structure our organization is capable of repeatedly adjusting to changing mission contexts.	
10	If needed our organization can add new types of missions to its existing operational product portfolio.	
11	Our organization regularly implements new technologies.	
12	Our organization is proactive in seeking a fit between what it can offer and what our politicians are expecting.	
13	Our organization tries to secure its added value by being capable of dealing with all kinds of crisis situations	

Summary statistics and correlations

	N	Mean	S.D.	Min.	Max.	(1)	(2)	(3)
Modular Organizing	1,208	3.51	.36	1.86	4.64	---		
Organizational Sensing	1,208	3.08	.59	1.00	5.00	.47**	---	
Responsiveness	1,208	3.43	.38	1.62	4.54	.46**	.46**	---

** Significant at the 0.01 level (2-tailed)