Prism

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Arthur D Little

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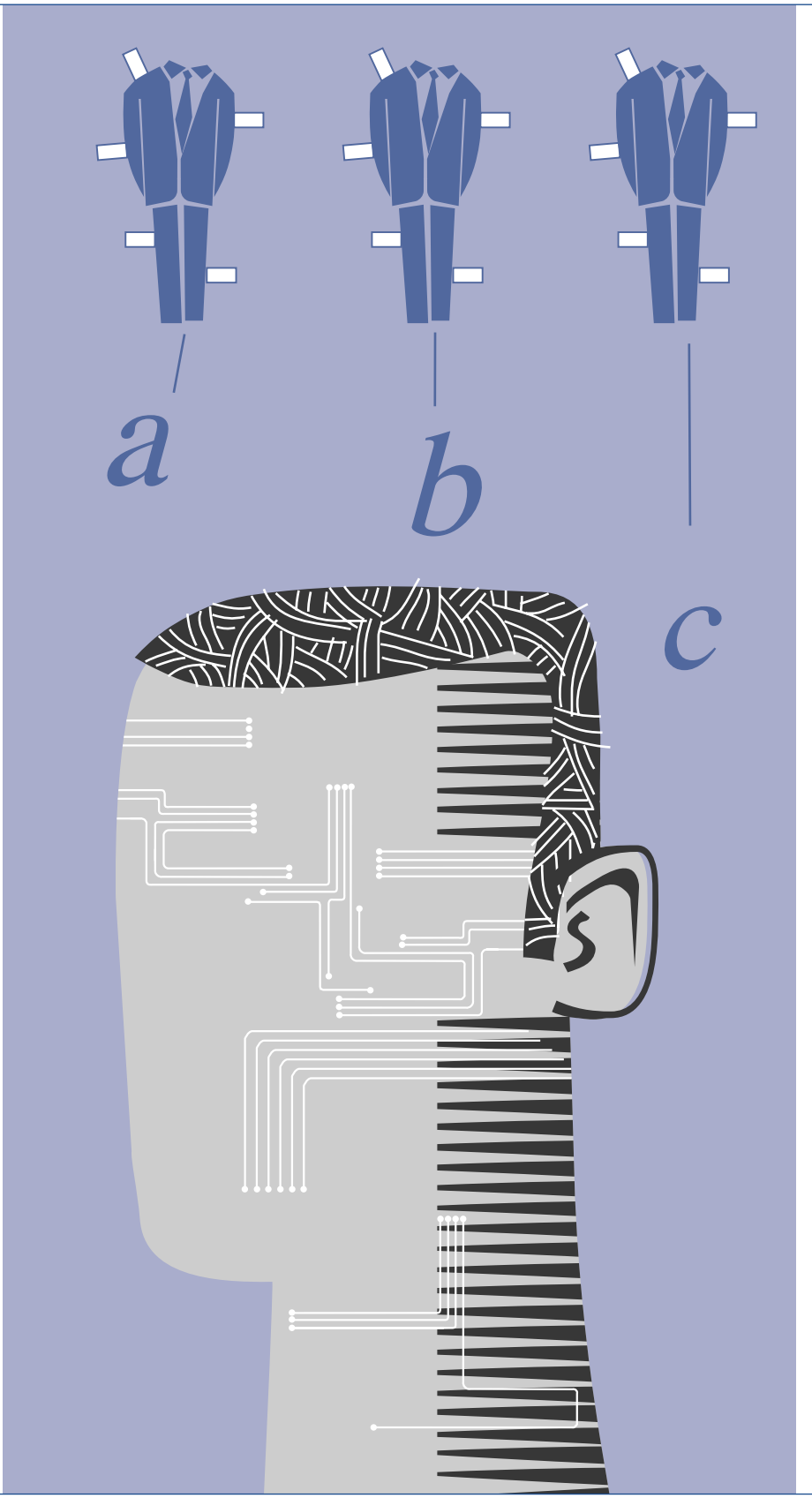
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The CTO / R&D Director as an Enabler of Strategic Growth

Björn Henriksson, Nils Bohlin, Mattias Stenberg

Even though technology and innovation management have intensified, the definition of the role of the CTO running these activities is still fuzzy. But he is most vital for the success and the future growth of the company. Henriksson, Bohlin and Stenberg identify three generic types of companies to discuss the role of the CTO. The authors show advantages and disadvantages for different set ups, and how companies can define the role and improve their innovation output.

In a time of increasing demands from shareholders for growth and future cash flow, the focus on technology and innovation as a revenue driver has intensified. This development has accentuated the role of the CTO as an enabler of technology and innovation generated growth.

Even though the role of the CTO is becoming ever more important, it is still not established in many corporations. Where it is implemented the definition of the role may differ widely depending on the type of company and the CTO title remains an uncommon one in the international community compared to titles as CEO and CFO.

So what should the role be? How should he or she act? And what can corporate executives do in order to intensify their CTO function?

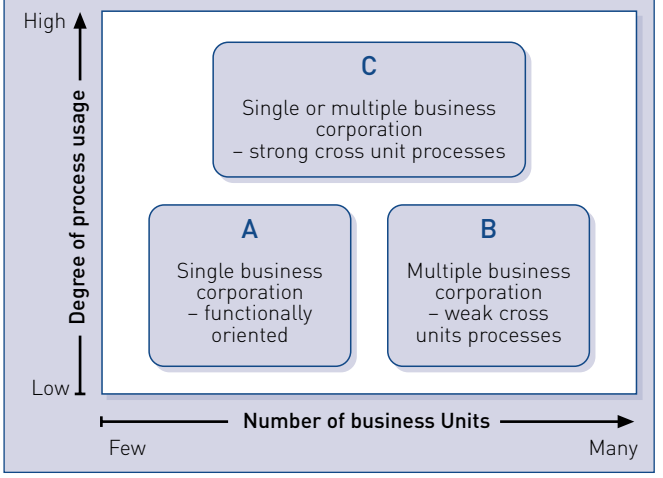
Arthur D. Little sat down to describe the different roles of the CTOs using three generic types of organizational models as a basis for discussion. Each represents different corporate types in the way it employs cross-functional processes and the number of technology focused business units it operates.

This article will suggest the key tasks for the CTO of the future in order to be an enabler of revenue growth in the type of organization where technology and innovation is the basis for gaining or maintaining a competitive advantage. It will further stress the importance of the CTO to become an executive member of the management team, and that the officer can design, implement and maintain a cross-functional innovation system/framework serving as an enabler for the implementation of corporate innovation. The system is built by processes, governance structures, people etc. Finally the article will give insight into how companies that want to strengthen their CTO function can identify potential for improvement.

The role of the CTO differs depending on the state of the organization

The three generic organizational models we scrutinized each represent different companies with respect to the number of business areas and their maturity in leveraging company wide processes.

Exhibit 1 Three Generic Organizational Models



Model A represents a single business unit company that is organized with separate functions for research and development, manufacturing, marketing & sales etc.

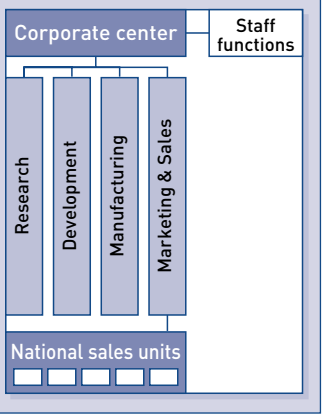
In model B, the company is a multiple business corporation that is organized around its business units. The company is equally mature with respect to leveraging company wide processes as model A, and it has introduced a cross unit technology and innovation process. However, it is still very weak and poorly leveraged. It has fuzzy coordination between the units, and different elements are in place in different parts of the corporation.

Model C, represents both a single and a multiple business unit company. Compared to model A and B, here the company is much more mature in leveraging company wide processes, and a technology and innovation system/framework is fully implemented across the business units.

Model A: The single business oriented corporation with a weak cross functional innovation system/framework

In many single-business companies with a functional organizational set up (research and development, manufacturing, marketing and sales etc.) the prime person responsible for technology and innovation is a technical director. These people are in many cases appointed with broad technical and functional responsibilities and also have a long experience of up to 15 to 20 years.

Exhibit 2 Model A: A Technical Director with a Broad Set of Functional Tasks is a Frequent Solution



Over the years experience has shown that this set up sometimes has serious drawbacks for managing technology and innovation proactively. People in this role set up sometimes spend too much time on managing day-to-day problems, and have very little time for managing cross-functional technology and innovation issues. As a matter of fact, the role in some cases is not designed for primarily taking responsibility to create innovation output, but rather for managing internal assets.

Model B: The multi business unit corporation with weak cross unit managed innovation system/network

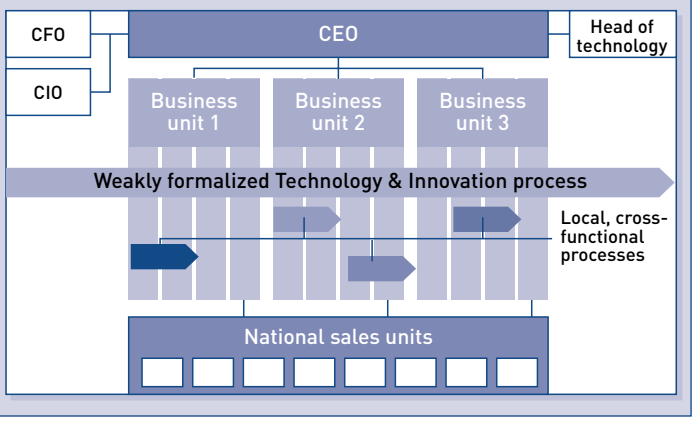
A very common situation is a multiple business corporation organized around its business units, with a rather weak innovation system/framework that is only partly in place. Even though aspects of the system/framework are working in various parts of the company, the overall coordination and commonality of it is poor.

Though different parts of the company might have structures for starting and running new development activities, each business unit has different methods, which makes it hard for top management to get an overall status on R&D progress.

Often the CTO / R&D Director in these situations is a person with a solid scientific or engineering background. Sometimes he or she is part of the corporate management team, sometimes not. Normally they are part of the strategic planning process, but seldom responsible for it. In some cases the CTO is responsible for specific corporate functions such as environmental affairs, quality etc, but often is not. Since the technology & innovation management system/framework is weak and these persons only have limited functional responsibilities the role in many cases becomes fuzzy and will only have limited impact. From a CTO point of view, it is very much a “stuck in the middle” kind of situation. Neither does the officer have functional resposibilities, nor is he or she confronted with an implemented innovation process to work through. In some cases these people end up as advisors, giving second opinion, and becoming task force leaders or networkers. People working in this environment some-

times feel frustrated over their lack of operational impact at the same time as their influence on strategic management decisions are limited. As a matter of fact experience shows that one of the key ways of being successful in this set up is either to gain credibility by being perceived as speaking the voice of the CEO, or to have a very long experience and therefore gaining respect and influence.

Exhibit 3 Model B-type Companies have a Few Processes in Place for Managing Technology & Innovation



Model C: The single or multiple-business unit structured corporation with a strong holistic innovation system/network

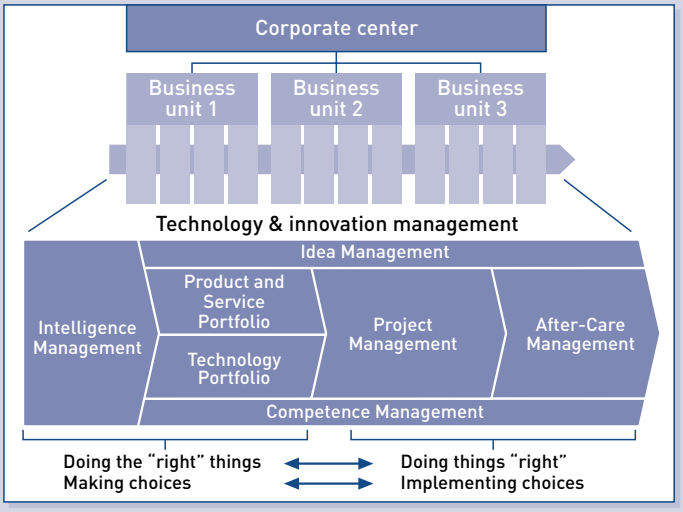
In model C, a holistic and cross business unit technology and innovation management system/framework is used. This model very much represents the state of the art approach for managing technology and innovation in a single and multiple-business unit corporation and is a significant improvement over models A and B.

It is important to note, however, that the system/network in these companies is not primarily coupled to the organizational structure. This is usually a mistake and creates serious drawbacks. It would be better if the system/network were cross-organizational, build upon processes, governance structures, common vocabulary, IT solutions, etc.

The CTO/R&D directors working in companies that are mature in managing corporate wide processes generally differ from their colleagues working in model A and B companies. Besides the fact that they have shifted from a classical functional responsibility into a process owner responsibility, generally three kinds of major differences can be seen[1].

[1] The emerging leadership role of the Chief Technology (or Chief Research) Officer; Professor Jean-Philippe Deschamps; Insights; Alliance for Technology-Based Enterprise; No.6, July 2000.

Exhibit 4 | Model C: Cross Functional/Business Unit Technology and Innovation Management Processes



- They are full time members of the top management team with loyalty to the company's shareholders rather than to their R&D peers.
- They have managed to qualify themselves as real creditable business partners, sharing the same business understanding and the same vocabulary as their management colleagues.
- Their management skills differ. They have a talent for managing cross functional processes, make tradeoffs between technology and business objectives, and have good leadership skills for motivating and creating change in the organization. They are also - which is one of the most important aspects - committed to tangible results.

The CTO needs to become an executive with clearly defined responsibilities in order to enable strategic growth

Based on the three generic organizational models we have discussed, different types of a CTO suit different situations. However, in client cases Arthur D. Little experienced that companies that want to improve their ability to grow through technology and innovation need to start managing their innovation across the company and secure a CTO function that is executive rather than man-

The Single Business Company that Improved its Process Usage

The CTO of a global 850 Million euro single business company manufacturing marine and industrial engines wanted to improve the overall output in terms of efficieny and product development. Historically the company had been rather functionally oriented with long lead-times in product development. Also the CTO was lacking the overall steering control of innovation activities. Project delays, budget overruns and unexpected problems were not unusual. To improve this state the degree of process usage was enhanced by means of refining the product development process. The key to success was a global project management system. Specific attention was given to continuously improving learning within the organization by introducing measurements to monitor performance and a whole process for starting improvement activities.

aging assets. So what does the role of the CTO actually comprise?

A survey on the future role of the CTO including interviews with 25 CTOs in the United States in the 1990s by Adler and Ferdows[2] offers some guidance. They identify the following roles - among others:

- Coordinate the technology efforts of business units.
- Represent technology at top management.
- Supervise new technology development.
- Assess technology aspects of strategic initiatives.
- Manage linkage to the external technology environment.

Given this list and our understanding of future demands on growth and cash flow, we are able to immediately identify some critical weaknesses in terms of what is missing: for example, commitment to end results, coordination of cross-unit R&D activities and aspects of globalization, or the effort of addressing cultural barriers, to name just a few.

[2] The Chief Technology Offices; Paul Adler and Kasra Ferdows; California Management Review; String, 1990.

Göran Harrysson, CTO of Tetra Pak: "The introduction of our global innovation process has been a key enabler for me as a CTO in order to steer innovation activities and commit to output results."

As a matter of fact, the above list representing the common understanding on the CTO role in many companies needs to be refined. It focuses too much on managing assets rather than creating prerequisites for future growth and cash flow. Arthur D. Little enhanced the list including other aspects in exhibit 5.

The Multiple Business Corporation with Strong Cross Unit Processes

Tetra Pak, a global multi business packaging company with a turnover of about 8 billion euro, wanted to improve its innovation capabilities. The company came to the conclusion that the implementation of a holistic innovation process would be key to this and also an important enabler for the CTO to steer, act proactively and operate as an executive commited to tangible results. Historically, the company had only a few parts of the process in place, and many parts were still missing or not common in the organization. On top this made it much harder for management and the CTO to get an overview of R&D activities, and to then lead and direct. In order to understand the current ability, and to initiate the right improvements the company invested in a thorough innovation audit and the development of a road map for improvements. Today, Tetra Pak with its CTO Göran Harrysson has managed to introduce a world class innovation process that has become a key enabler for the CTO function in order to steer innovation activities in the company.

Topic 1: Responsibility and process owner of the innovation system/network

First of all, the CTO has to become the process owner of the innovation system/network. This means that his task is to ensure that key aspects of innovation are managed efficiently. Arthur D. Little's best practice[3] experience is that the innovation system/network should be built around six modules:

[3] Product Juggernauts - How companies mobilize to generate a stream of market winners; Jean-Philippe Deschamps and P. Ranganath Nayak; Arthur D. Little In., Harvard business school press 1995.

- Technology, customer and competitor intelligence.
- Product/service/technology strategy and planning.
- Program management (product development execution).
- Idea management.
- Resource management.
- After-care management (product/service/technology maintenance).

To put these modules into operation the CTO/R&D director has to use processes, governance structures, common definitions, IT etc as the building blocks. As a support in managing the system/network the CTO should appoint sub-process owners for the different modules.

It is important to understand that the innovation system/network must be a holistic solution detached from the company's organizational set up for everyday business. Companies, which have not implemented their innovation system/network in this way normally end up in endless discussions in questions like which part of the organization is responsible for novel ideas or where business intelligence should be located.

Topic 2: Responsibility for the strategic linkage between technology activities and business objectives

Secondly, the CTO should be responsible for securing the linkage between technology and business. This means:

- Formulating a technology strategy for the company on a 5 to 15 year horizon.
- Coordinating the implementation of technology strategies across and between the divisions.
- Managing the company's key technologies and the in- and out-licensing of technologies.

This task is usually the original task of the CTO/R&D director, as defined by Adler and Ferdows[4].

Topic 3: Responsibility for the long-term strategic aspects on R&D organization

Thirdly, the CTO should be responsible for the long-term strategic aspects of the R&D organizational setup.

In the environment of globalization, M&As and technology shifts, the aspect of a competitive R&D organization is

[4] The Chief Technology Offices; Paul Adler and Kasra Ferdows; California Management Review; String, 1990.

becoming important. Many companies face redundancies between research activities and find global R&D challenging. Usually this is the responsibility of the R&D managers in the different business units. However, these managers are too often too busy managing day-to-day problems, so that someone with a strategic horizon needs to support them.

Topic 4: Steering the biggest cross-unit projects and new technology projects

Fourthly, the CTO should be a steering group member of up to five of the most important cross-unit projects in the company with respect to risk/reward. Also, he or she should be responsible for the control of new technology projects outside the normal business unit activities.

The CTO should be a member of these steering groups to make sure that the most important projects, which will decide the future of the company, receive the management attention they deserve. In some companies the most important project even has a common steering group including the whole top management team.

Topic 5: Responsibility for addressing cultural aspects of innovation in the company

Fifthly, the CTO should constantly monitor the innovation culture of the company and work on its improvement.

Any initiative to boost technology & innovation management activities will be useless as long as there are unhidden cultural barriers. These cultural barriers are fostered by the company's measuring systems, the company's reward systems, and management's style of communication or actions.

Exhibit 5 **Five Key Tasks Typically Define the Role of the CTO**

Key themes in the role of the CTO
1 Build/refine and own the Innovation process (business intelligence, product/technology strategy and planning, project management, resource management, product maintenance and idea management).
2 Secure linkage between technology and business • Formulate and manage technology strategy corporate wide (5–15 years horizon). • Coordinate implementation of technology strategies across and between divisions and SBU:s (3–5 years horizon). • Monitor and give strategic directions on the key technologies in the company. • Control in- and out-licensing of technology.
3 Give strategic directions for the R&D organization (5–15 years horizon).
4 Monitor (steering group member) of the biggest cross-corporate wide product/technology projects with high business impact/risk.
5 Address innovation culture in the company.

Insights for the Executive: Identify potential for improvement

Step 1: Understand your current ability

In order to know where and how to improve, companies need to know where they currently are in terms of their CTO model. Generally companies' ability to set up a cross-unit and holistic technology and innovation management system/network (as in model C) goes through three phases. In the first phase, they have managed to put a common product development process in place with phases, toll-gates, deliverables and follow-up systems. They most often also have some kind of formal way of linking feedback from customers into their R&D activities.

In the second phase, they address the issues of product and technology strategy and planning. Most often they formalize a process for these activities. This is normally done in close relationship to the annual business planning activities in the company. In this phase companies also start to address the aspects of resource management with respect to core competencies, identification of key suppliers, formalization of supplier integration etc.

In the third phase, the company has become very advanced. Here it starts to address and formalize business intelligence and idea management - how to identify, screen and bet on new innovative ideas. In this phase many companies also start to understand the aspects of their company culture and how it supports and creates barriers for technology and innovation management.

In order to know where to start building a system/network, companies need to be aware in which phase they are. And they must know their ability in the different modules of the generic innovation system/framework.

Tetra Pak, a global multi business packaging company with a turnover of about 8 billion euros, wanted to improve its innovation. They came to the conclusion that the implementation of a holistic innovation process would be a key competitive advantage. Historically, the company had a few parts of the process in place, but much was missing or not widespread in the organization. This made it even harder for management to get an overview of R&D activities, and then lead and direct them. In order to understand its current ability, and to initiate the right improvements the company invested in a thorough innovation audit and the development of a road map for improvements. Today, the CTO function and Tetra Pak's innovation process are world class, and seen as a benchmarking target for many other companies.

Step 2: Prioritize between giving direction, planning, coordinating and operational activities

Given the role of the CTO as multi-tasker, they cannot spend 100 percent of their time on every task. So where should the focus be?

Arthur D. Little's experience with clients shows that the answer must come through a common understanding of the company's unique situation and the question of how advanced it is in managing technology and innovation. Top management and the CTO should jointly agree on the tasks that need directives, the ones that need a planning/coordinating role, and the ones that should have a direct operative role for the CTO.
Göran Harryson came to the same conclusion. In the beginning, he was very much involved in the development and implementation of the "Innovation Process"

itself. Today, it has become more of a monitoring/refinement task, and he thus spends more time on other strategic issues. However, he still is the "Innovation Process" owner and uses it as an enabler for being an executive.

Step 3: Secure a governance structure for managing improvements and develop a plan

Implementing and managing improvements is not a one-man job, even though the CTO is the one responsible overall. When looking at successful companies that have addressed their innovation system/network and successfully made improvements, some conclusions can be drawn. First of all these companies' top management teams have made technology and innovation their strategic priority. Secondly, they have formed a board of senior executives that manage improvement of different parts of the system/network. Thirdly, they have defined the responsibility and authority of the different roles in the innovation system/network, deciding who, what, how and when.

In the case of Tetra Pak management decided to introduce the "Innovation Process Board", as one of the key governance elements. The group is the highest decision-making body regarding how innovation and product development is conducted. It includes the CTO as its chairman, the Business Unit Presidents and some other key people. While the Innovation Process Board is responsible for monitoring the improvements of how things are done, the Product Cycle Plan group prioritizes what is done and when. The Product Cycle Plan group includes the Regional Presidents, Business Unit Presidents, Strategic Business Development and the CTO. The CTO Göran Harryson also is a steering group member for the major product/technology projects in the company. And the Innovation Process Board regularly conduct thorough innovation audits throughout the whole corporation. Based on this they initiate new improvement projects.

As pointed out, key for the improvements is a common and current understanding of your innovation ability, shared in your management team. This is where you start.

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