

Introduction of Symmetric Innovation System

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Abstract The fact that innovation directly contributes to a corporation's growth has been well documented; consequently, most companies have implemented a variety of innovation promotion programs. In general, the inventors actively search for new solutions to help the company's businesses and the company implements incentive programs to reward the inventors. However, most innovation processes involve observing a Challenge, Problem, or Need (CPN) and providing a solution to it. Therefore the inventor must be the CPN observer for the innovation system to work. Unfortunately, inventors represent a very small population in any company; hence their accessibility to CPNs is limited. Here we introduce a new innovation system - Symmetric Innovation System (SIS), based on our study on the innovation initiation process. In Symmetric Innovation System the inventor no longer has to be the CPN observer. The system provides a mechanism purposely built to collect CPNs from all employees, even though they do not have solutions to the CPN. Consequently, the inventors within a company will be exposed to many more CPNs, and therefore be much more innovative. The key point of this new innovation system is to treat the CPN observer and the inventor more symmetrically in terms of incentive and reward for their contribution. Innovation websites, newsletters, and seminars are possible platforms to implement the SIS process. The goal of introducing SIS is to improve a company's bottom line financials by becoming more innovative with a higher growth rate.

Key words innovation, management, growth, symmetric system

1 Introduction

No one would argue about the importance of innovation to the success of a company. Innovation is one of the key factors to being competitive in a fierce market. It is not only true for a company's businesses but also true for the future of a country's economy. Now that the world is flat due to globalization [1], how to maintain the economic strength of the United States becomes a big issue. Innovation promotion has been considered a crucial step to differentiate the U.S. economy from other economies. Recently we have seen quite a few innovation-oriented initiatives proposed by political leaders. During 2006 the Innovation Competitiveness Act (H.R. 4585) was sponsored by Congressman Bob Goodlatte (R-VA) in the House and the National Innovation Act (S. 2109) was introduced by Sen. John Ensign (R-NV) and Sen. Joseph Lieberman (D.CT) in the Senate. In the same year President Bush announced American Competitiveness Initiatives (ACI) during the State of the Union address [2]. Last year, two other related acts – the America COMPETES Act and the American Innovation and Competitiveness Act (S. 761) were passed by the Senate in April. COMPETES stands for Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science. The 21st Century Competitiveness Act of 2007 (H.R. 2272) was passed by the House in May [3]. All these initiatives have a single goal: maintaining the competitive edge of the United States by promoting more innovation in industry, education, and science. Seeing how the country is taking actions to increase innovation, it only makes sense that companies should also do the same to become more competitive, in the business world.

Innovative concepts, designs, or implementations are behind almost every step of progress we make in our industry. The importance of innovation is not only conceptual but also supported by solid data. For example, during the ten-year period (1991 through 2001) the average Compound Annual Growth Rate (CAGR) of the 25 most innovative companies in S&P500 is 27.7% while that of the whole S&P500 is 11.1% based on Evan Schwartz's study [4] (Figure 1 is generated based on the data shown in Ref. 4). The top 25 S&P 500 companies with the highest patent scores (which measure how often a company's patents are cited by papers and other patents and how fast a company's patents yield marketable products) have about 2.5-times higher growth rates than that of an average company. The results show that we can not afford to underestimate the impact of innovation on our business. Figure 1 shows the comparison of the growth curves of the companies with the highest patent scores and of the S&P500 average, where it is assumed that \$1,000 was invested in the year 1991. The obvious benefits of

innovation have led many large companies in the US to implement various programs to promote innovation.

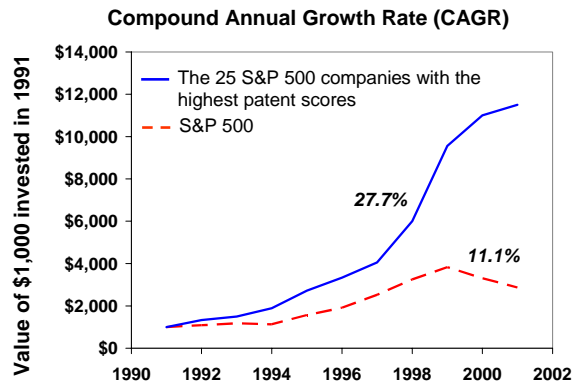


Figure 1 Comparison of Compound Annual Growth Rate (Ref. 4)

The most common innovation promotion programs we have seen are those focused on encouraging employees to create and submit new solutions to the company. The solutions include new concepts, new designs, or new business models, which have the potential to help the company’s business. In most cases these ideas represent intellectual property and in most cases the new solutions will be disclosed to the US Patent and Trademark Office (USPTO) as patent applications. Owning patents not only allows a company to protect its intellectual property, but also provides a strong defense against costly law suits. In general, the company provides incentive programs that give monetary or other rewards to the inventors. For example, the company may implement a patent application award program in which an inventor will be given a certain amount of money for each filed patent application. No doubt these programs have stimulated employees to come up with more new ideas and as such allow the company to generate more intellectual property, but this approach only taps into a small percentage of the employee base. Here we introduce a new innovation system which implements incentive programs in a more efficient way.

2 Study Results of Innovation Initiation Process

When most companies rely mainly on the active inventors to create new ideas for their business advancement, they may not realize that the group of inventors is a very tiny portion of the whole employee population in almost any company. Here we use the word “active” to describe the employees who are actively seeking new ideas for the company based on their job function or personal passion and other employees, who are capable of generating new ideas, but just aren’t very active in doing so. As

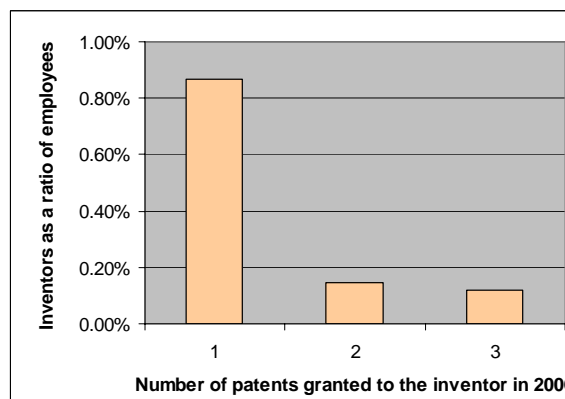


Figure 2 Inventor population ratio in Apple Inc.

an example, we can study the inventor population in a very innovative company. Apple Inc has been ranked the #1 innovative company by BusinessWeek for three consecutive years: 2005, 2006 and 2007

[5]. During 2006 Apple Inc received approvals of 107 utility patents from the USPTO. These patents were generated by 201 inventors in total. On the other hand Apple Inc had 17,787 full time employees for the fiscal year of 2006 [6]. If we compare the number of the inventors in 2006 and the total number of the employees, we easily find the inventors only account for about 1% in the employee population. In other words, even at the most innovative companies like Apple, inventors are a very small population of the company. Figure 2 shows the percentage of the inventors, who were granted one, two, or more patents in 2006, against the total employee population.

Another interesting phenomenon about invention we have studied is that most new solutions are directly related to a challenge, problem, or need the inventor was facing as found when reading the “Background” section in almost all patent applications. The generic definitions of “challenge”, “problem”, or “need” overlap to some degree, so we would like to give a narrower definition for each word for the purpose of this paper. Here “Challenge” represents something that bothers us but we just don’t have a good solution yet; “Problem” represents something we already have a solution for, but the existing solution(s) have obvious drawbacks; and “Need” represents a desire for a non-existing feature, function or design, or a desire for continuous improvement for existing solutions. To get a random sample, we studied the inventor’s motivation (“Background” section) on the first USPTO patent granted each month from 2005 to 2006 [7] (24 patents in all). According to the definitions of “Challenge”, “Problem”, and “Need” (CPN) stated above, three of the patents solve a challenge, ten solve a problem, and eleven solve a need as shown in Figure 3. The results indicate that inventors start their invention or innovation work by observing CPNs in most cases. If they do not observe (see, hear, feel, learn, etc.) the CPNs, the new solutions may not have been created.

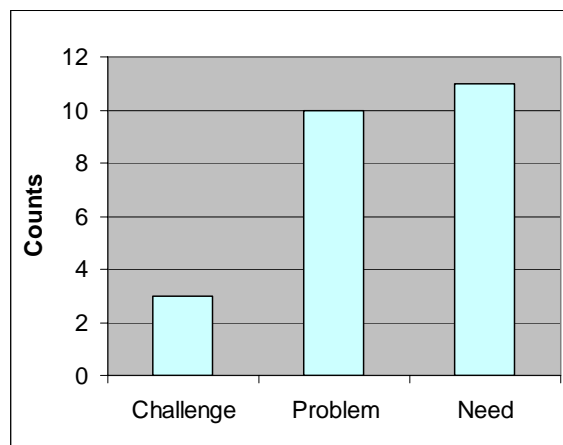


Figure 3 Motivation of the first US patent of each month during 2005 - 2006

If we put the two results in our study together, the conclusion shows that the innovation process most likely begins by observing a CPN and since the inventor population is small in any company, the overall observation capability of potential inventors is very limited. Consequently, there may be many CPNs that exist without good solutions, not because the solutions are too difficult to get but just because the CPNs have not been observed by individuals inclined to invent a solution. While the majority of a company’s employees may not be very active in generating new solutions, they could be an excellent source of CPN observation. Bottom line, in the current innovation system an inventor must also be a CPN observer to connect the CPN and a new solution or the CPN observer must be an inventor to produce an innovative solution. If we can separate this requirement and allow CPN observers and inventors to work separately, but in a collaborative way, the innovation process could be much more productive than it is today.

As mentioned above, the traditional innovation promotion process only provides means for employees to contribute their new solutions, such as patent disclosure submission process and screening process. Most incentive programs for innovation only reward the inventor. In most cases the inventor has the burden of both discovering a significant problem as well as creating a valuable solution to it. The CPN observer who does not have a solution yet to the CPNs is mainly excluded from the process. Therefore the traditional innovation system could be called an “Asymmetric Innovation System (AIS)”.

in which the CPN observers and the inventors are treated quite differently. Figure 4 shows the traditional innovation system schematically. There is no clear relationship between the CPN observers and the inventors (Figure 4a). The CPN observers outside of the small circle do not have a clear path to communicate the CPNs they observe to those inventors who might very well have a solution. Figure 4b represents the unbalanced innovation incentive program in a company. The contributions of inventors are well recognized while the potential contributions of CPN observers are rarely noticed. A similar concept of harnessing the focused observational assets of a larger employee base is applied to optimizing manufactured goods by Phillip Crosby in his famous book “Quality is Free” [8]. Every person should have the potential to contribute value by virtue of their unique perspectives and experiences.

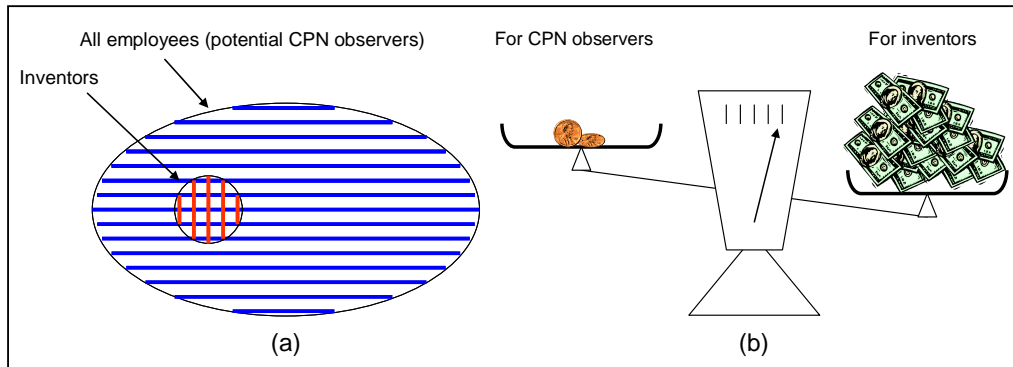


Figure 4 Traditional innovation system: (a) Inventors and CPN observers; (b) unbalanced incentive programs

3 The Symmetric Innovation System (SIS)

Almost everyone agrees that “knowing the problem is already half way to the solution”, which means knowing the CPN is equally as important as creating the solution in the innovation processes. However, in reality, the traditional innovation system does not reflect this common belief. Involving more employees in the innovation processes will not only help a company’s business but also brings along other benefits such as a broader sense of ownership, pride in the company, etc.. The question is how to build a system that matches CPN observers and subject matter experts (SME) with potential solutions. In this paper we introduce a new innovation system which is called “Symmetric Innovation System (SIS)” to further enhance the innovation process within an enterprise. In this new system CPN observers and inventors are treated more symmetrically and a higher degree of innovation productivity can be expected. The opportunities, challenges and examples of SIS will be discussed as well.

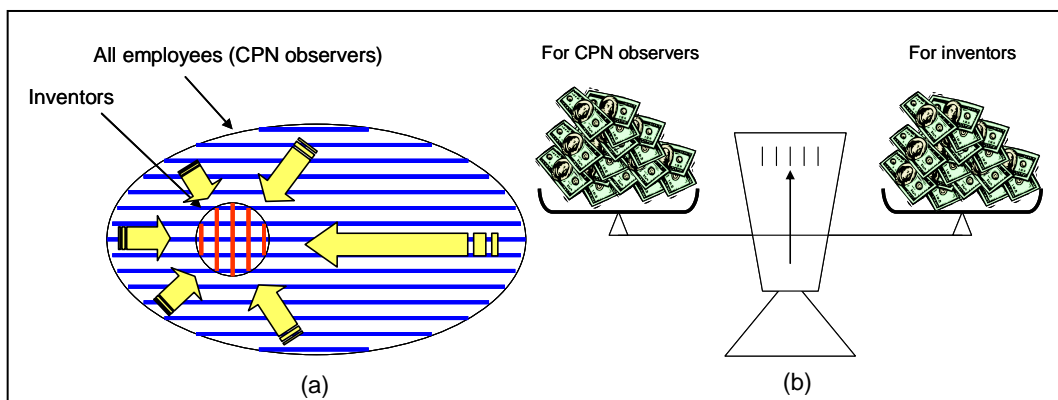


Figure 5. Symmetric Innovation System: (a) CPN observers’ contributions; (b) balanced incentive programs

Contrary to popular belief, new ideas rarely happen by accident. Alternatively, they happen more predictably when an effective process is used. To further enhance innovation in a company, we need to leverage as much as possible of the entire employee base and not just the small sub set of inventors.

In their daily jobs, many employees see, hear, or otherwise experience CPNs. If we can collect these CPNs and feed them to innovative subject matter experts, there will be more opportunity for realizing innovation in the company.. It is a new concept to explicitly include the CPN observers in the innovation promotion process; therefore a proper mechanism must be implemented to treat CPN observers and inventors more equally. Although we recognize the continued importance of creating solutions, we will concentrate on the effects of adding an explicit problem identification step to the process. The goal is to reach a more symmetrical innovation system. Figure 5 shows the balancing principle of the Symmetrical Innovation System (SIS). With SIS the CPN observers represented by the area shaded by horizontal lines in Figure 5a are able to contribute the CPNs they observe to the inventors and are treated more equal by the incentive programs (Figure 5b). The principle elements of the symmetric innovation system are described in the schematic diagram (Figure 6) and the following sections.

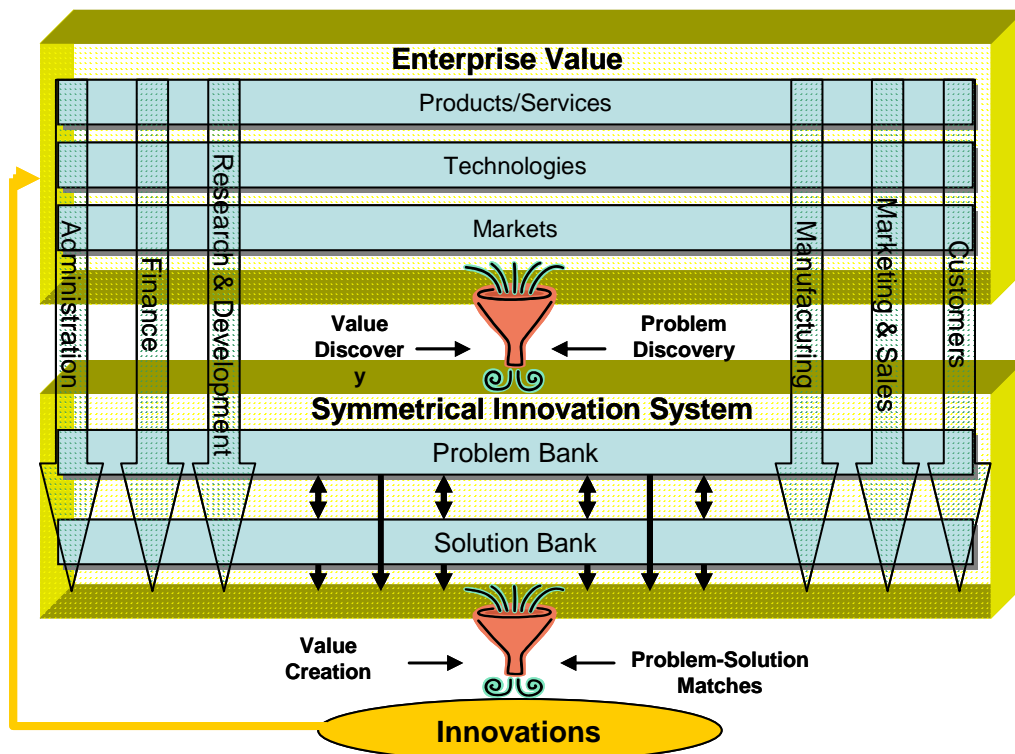


Figure 6 Enterprise Symmetrical Innovation Schematic Diagram

3.1 CPN discovery and collection

Scientists and engineers are educated to solve problems throughout their careers. However, they are limited in the range they are able to observe their environment to discover problems waiting for solutions.. Effectively engaging as many people as possible in the problem discovery process will help innovation. This is a basic premise of SIS. Product marketing professionals and market analysts are typically tasked with identifying problems. This is clearly an aspect of the SIS approach. But no matter how valuable these functions are, they are usually focused on recognizing and defining opportunities for direct revenue generating, market related problems, not a wide spectrum of internal and external CPNs.

By expanding the base of incented problem explorers to the entire organization the opportunity to uncover new and important problems is multiplied. Therefore, this part of the SIS process should be made as easy as possible to collect and communicate problems once they are identified. There are many ways that companies gather data pertaining to innovation. The SIS concept is relatively independent of the CPN collection method. Generally a central repository for CPNs can be created to store them along with the other components of the overall innovation management system.

Today, electronic communications provide highly efficient methods for sharing information throughout organizations, especially within enterprises. The inherent isolation of the company's electronic networks from the outside world creates a relatively secure and private environment for exchanging potentially sensitive proprietary information. Within this environment SIS may include a website or an email address for employees to submit the CPNs they observe even though they do not have solutions yet. So the more people thinking about the problem applications, the more effective the final problem definition may be. With the CPN collection function, the company can harvest many challenges, problems, and needs which may be missed by the inventors alone. The collected CPNs then become a pool of stimuli called a Problem Bank for potential inventors to generate new solutions. Intellectual property ownership issues frequently can be a major impediment to effective functioning of the broad collaborative relationships we advocate. However, these issues are largely avoided in a corporate setting since usually all employees are covered by a common intellectual property assignment agreement.

3.2 CPN value screening

Of course, not all CPNs collected are useful for new solution generation. A CPN screening process must be implemented for picking the valuable CPNs, which we may call qualified CPNs. The qualified CPN should satisfy at least the prime criterion: any potential solution for the CPN must have a positive impact on the company's business. Otherwise why bother? Also, it is important that the potential solution does not create more problems than it solves. Unfortunately all good ideas do not ultimately produce results that affect the company's bottom line positively. The resulting qualified CPNs are then funneled into the solution creation process.

3.3 Solution creation process for qualified CPNs

The qualified CPNs obtained in the screening process must be fed into a process to seek new solutions. In this process, many different formats for solution discovery could work. The process is essentially finding a match between the CPN and either a new or existing solution. A comprehensive description of these methods is beyond the scope of this paper. However a couple examples are instructive.

A multi-disciplinary brainstorming session is frequently a good format. The session should include both subject matter experts and active inventors who may not be necessary in the targeted area. Many times a subtle problem in one area may gain a solution from an "outsider" because they often bring in fresh air. The different perspectives provide a rich foundation for generating stimulating questions and unique observations from people that are not blinded by expert knowledge or conventional approaches. Remember we are looking for unconventional thinking to produce remarkable results.

As another example, we advocate a straight-forward method of creating valuable problem-solution sets that can even more quickly generate effective outcomes. The concept involves gathering solutions that in the past may or may not have been applied to a problem into a repository called a Solution Bank. This bank captures and contains all the existing solutions in the enterprise no matter what application they may have been initially created to address, including those that may be lingering unused in a dusty corner. By using well known computer matching algorithms, a simple search of the Solution Bank contents for matches or correlations with each Problem Bank element can result in using existing solutions to solve problems. Using, modifying, or re-using, an existing solution is much more efficient and cost effective than creating solutions from scratch. This concept can be applied to solution databases outside the company as well, but the cost will be generally greater.

The solutions generated in these processes can be protected as intellectual property of the company as appropriate.

3.4 Applying solutions to create value

The ultimate goal for innovation is to introduce new solutions which can help the company's business, therefore the solution generated based on the collected qualified CPN must be applied to the business practice. In this process the new solution will be introduced to the related departments in the company. Each company will have its own way of managing and deploying the solutions it discovers. The innovation management team may work with the departments to implement the new solutions if necessary. It is very critical to avoid any conflict of interest in this process. As long as the team and the department have consensus that implementing the new solution is beneficial to the common interest and the team maintains its impartial role as a facilitator, there will be less issues.

3.5 Incentive mechanism

The incentive mechanism is an important building block for SIS. The detailed methods can vary. For example, if a CPN triggers an invention, the original CPN observer should share the award of the

solution as well. A well conceived incentive program is a mandatory part for the system to be sustainable. Incentive rewards can take many forms, and this aspect of the system should be tailored to the particular culture of the company. The basic idea is to recognize and reward those who discover qualified problems proportionately to those who solve them. Allowing all employees the opportunity to directly participate in the rewards of innovation can be a significant motivator for the entire organization.

3.6 SIS Implementation

We are in the process of introducing SIS at Verizon Communications, a large and well known enterprise with over 200,000 employees worldwide. Initial CPN collection will be encouraged by adding a new sub-section to the existing internal "Verizon Innovation" web site that allows employees to submit CPNs which will be reviewed and directed to SMEs (Subject matter experts) for resolution. If intellectual property is generated as a direct result of the CPN submission, then both the CPN provider and the solution provider will be rewarded for their contributions in the invention process.

4 Advantages of SIS

The primary advantages of the symmetry innovation system are:

- Remove the need for an inventor who must observe a CPN first to start a innovation process or for a CPN observer who must generate a solution to an observed CPN by himself. Here the inventor and CPN observers are not mutually exclusive. An employee could be a CPN observer in one event and an inventor in another event, or be both.
- Collecting CPNs and generating new solutions are complementary parts of a more complete innovation system.
- More employees will be involved in the innovation processes by submitting a CPN they observe as opposed to waiting until they can come up with a solution on their own without the fear of not being involved in the innovation process.
- New solutions generated by this system will help the company's businesses in both near term and long term. Employees will be more motivated, the company will be more productive, and a higher growth rate can be expected.
- Long standing yet subtle problems may trigger new innovative solutions in relatively short time periods. Many hidden problems will be discovered as challenges in the new system, as will new market needs. With this new system the entire employee base can become a complement to the company's marketing organization without incurring any additional cost to the company.
- Big business challenges can be brainstormed by a group of inventors. The results could be a nice complement to the existing processes.
- Employees will be much more willing to submit CPNs knowing that they will get credit for being a significant part of the innovation process.

5 Conclusion

Here we introduce a new innovation enhancement concept termed Symmetric Innovation System (SIS) based on our study. In Symmetric Innovation System the inventor no longer needs to be the Challenge/problem/Need (CPN) observer by himself/herself. The system also provides platforms purposely built to collect CPNs from all employees even if they do not have solutions yet. The inventors will then have access to many more CPNs that exist in the company and therefore could be much more productive. The key point of the new innovation system is to treat the CPN observer and the inventor more symmetrically in terms of reward for their contribution. Verizon Innovation is a trial website for SIS and the feedback has been positive to date. CPN discovery and collection, CPN value screening, solution creation process for qualified CPNs, applying solutions to create value, and incentive mechanism are discussed in details. The goal of introducing SIS to a company is to make the company more innovative with higher growth rates.

Acknowledgement

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