



DRIVERS OF GREEN SUPPLY CHAIN MANAGEMENT

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ABSTRACT. Background: In the manufacturing business, producers have been facing the problem to decrease the environmental effects during the manufacturing procedure. There is a need for the dedication and resources to address these issues. Management concerns, environmental controls and stakeholder concerns in environment control should be addressed. However, the managerial concerns and size of firms, account as a critical component for influencing the selection of green innovation practices. Along these lines, the reason for research is to explore the impact of those elements affecting producer to adopt green innovation practices.

Method: The data is collected through a quantitative approach. Questionnaires were distributed among 150 manufacturing enterprises. Statistical Package for the Social Sciences (SPSS) version 23 is used for data analysis. Simple liner, corrections and KMO analysis are applied to the data.

Results: Results show that managerial concern is the essential driver for the selection of green practices. Significant connections have been found between government regulation, stakeholder pressure and business size with the selection of green innovation practices.

Conclusions: Study throws light on the elements that affect the adoption of green innovation practices in supply chain management of the manufacturing industry. Green supply chain management is essential for the enterprise's sustainability. Green supply chain management is still under developing stage in Pakistan. The study has identified several factors those can play a vital role in the adoption of green supply chain management. This research will be helpful in developing policies and to the better understanding towards adopting green innovation practices.

Key words: Green innovation, Supply Chain Management, Green Supply Change Management Environment, Sustainability, Pakistan.

INTRODUCTION

Supply chain and energy security are two emerging issues in the current business era. The industries and enterprises are managing to reduce their effects on the environment [Hart 1995, Henriques, Sadorsky 1999, Walker, Di Sisto, McBain 2008]. The emerging development has shown severe issues related to natural pollution and environmental changes, which intensely influenced individuals' ordinary lives [Li et al., 2017]. The expanded globalization of logistics and supply chain are facing challenges related to the environment. Enterprises are trying to identify

the green innovation practices which incorporate with existing supply chain management to reduce environmental impacts [Mollenkopf, Stolze, Tate, Ueltschy 2010]. The organization, green management practices, help to reduce the cost and enhance profitability [Klassen, Mclaughlin, Klassen, Mclaughlin 1996]. Stakeholders such as customers, societies, and international agencies have been building up pressure on the organizations to adopt "green" practices [Hoffmann, 2007; Zhu, Sarkis, Lai 2008]. The organizations should consider the impact of products on the environment. Green technology is a critical approach for accomplishing sustainable development.

Several studies on adoption of organization green development practices have concentrated and focused on either outside or inner drivers [Li et al., 2017]. The need for natural resources is expanding quickly with the rapid innovation of the worldwide economy.

The consumption of natural resources is becoming more dangerous. The usage of the green supply chain management can achieve the win-win approach to financial and natural benefits. In recent years, growing attention among consumers, government, and community towards environmental health have given importance to green innovation among industrial sector in developing economies [Storey, Emberson, Godsell, Harrison, 2006]. The enterprises believe in the concept of the green supply chain. Companies around the world adopt green practices with the aim to reduce environmental impacts and improve financial performance. Supply chain management (SCM) field is emerging in the developing sector, and it is significantly important for the practically and academically [Zhu et al., 2008]. It is essential to explore the green supply chain as it is directly related to the environment and explore the fundamental problem of nature related to manufacturing [Srivastava, 2007]. There are different views about GSCM in the research. [Sarkis, Zhu, Lai, 2011, Zsidisin, Siferd, 2001] Have considered a broader perspective of SCM and GSCM. Similarly, [Zsidisin, Siferd 2001] characterized green supply chain management as a: “The set of supply chain management policies held, actions taken and relationships formed in response to concerns related to the natural environment with regard to design, acquisition, production, distribution, use, re-use and disposal of the firm’s good and services”.

The Pakistani government has various objectives to enhance environmental performance. The government has defined a forceful objective of low carbon dioxide (CO₂) discharged below than 30 percent [Nadeem, Hameed 2008]. Pakistan is most helpless against the impacts of environmental change. [Kreft, Eckstein, Junghans, Kerestan, Hagen 2014] report Pakistan among the couple of nations that are intensely influenced by climate change. Since 2010, the country has to face extraordinary climate change, bringing

about financial loss of US\$6 billion (CPEIR, 2015). Even though Pakistan contributes less than one percent (0.8%) in reducing the impact of carbon emission, the Government of Pakistan has shown concerns to reduce the environmental change. The energy, transport, agriculture & livestock, forestry, town planning and industrial are the key zones that should need changes because of a fundamental role in environmental changes [Lin, Ahmad, 2017]. Green innovation also affects supply chain management of manufacturing enterprises in Pakistan.

Objectives of The Study

The research will explore the current situation related to the green innovation practices and the effect of drivers in the adoption of these practices in supply chain management. Due to environmental changes, the world is seeing drastic changes in nature. The study will open a new debate on the environmental regulation, managerial concern and stakeholder pressure in the adoption of green innovation practices in the supply chain department. More specifically, the research aims to identify green activities and to examine the green environmental practices. The research focuses on the environmental management, sustainability, CSR, and stakeholder theory.

Research Question

The following questions are developed for current research on the previous basis literature.

- How the drivers, i.e., government environmental regulation, managerial concerns and stakeholder pressure effect in the adoption of green innovation practices in Pakistani manufacturing industries?
- The strength of drivers in the adoption of green innovation practices in Pakistan manufacturing industry?

LITERATURE REVIEW

Supply chain management as a subject has been around mainly in the field of agriculture

and military. Logistics appears as a subject in the early 1900s. Logistics and supply chain was taking as a vital subject since the 21st century. [Kent Jr, Flint 1997] discussed the point of view related to the emergence of SCM as an idea. Supply chain and energy security are emerging agendas and issues in the modern business world. World Economic Forum has highlighted the areas which design the future with “central to the functioning of the world economy and the well-being of the global society” [Halldórsson, Kovács 2010]. Nowadays the manufacturing industries are facing intense pressure from stakeholders such as customer, government, media group, and pressure houses to adopt green practices and use a renewable energy source to produce goods and they prefer goods that are

environmentally friendly. [Abukhader, Jönson, 2004] define the effect of supply chain and environment as the effect of the supply chain on the natural and the effect of environment on the supply chain. In previous literature, it shows the effect of the supply chain on the environment whereas fewer studies show the effect of the environment on the supply chain. Abukhader, Jönson [2004] researched the effect of environment on the supply chain. Green innovation is directly concerned with the activities related to the environment. Nowadays global warming and natural distribution are causing storms, floods, and hurricanes around the world. This destruction shows the importance of the adoption of green practices in supply chain management and logistics sector.

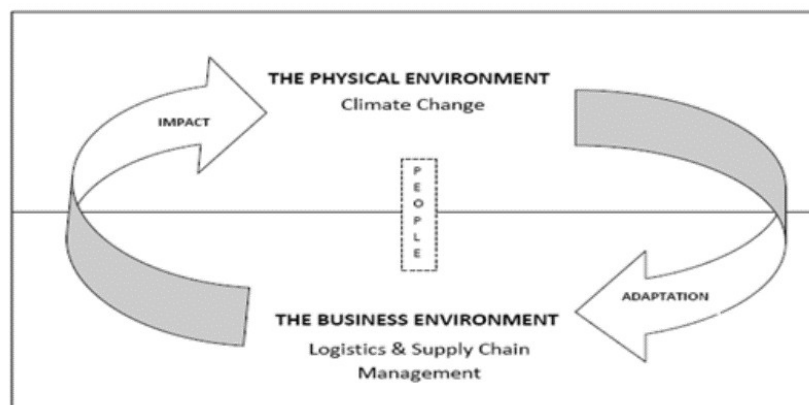


Fig.1. Relationship Between Logistics and The Natural Environment

The figure represents the dyadic connection between the natural and business environmental condition. The achievement of the relationship is dependent on the organizational capacity to relieve impacts on the typical environment and adapting to future environmental change.

Supply Chain Management is an emerging area highlighting essential gaps to be explored in its dimensions. There have been changing dynamics in the field of logistics previously opening new difficult horizons among the scholarly community and practitioners [Ballou, 2007]. The dynamics have now shifted from business efficiencies to environmental welfare promoting green activities. Regarding financial efficiency, supply chains will be more focused

towards profit maximization through implementing green activities [Skjoett-Larsen, 2000]. Supply chain management’s future research should be more focused on exploring the supply chain measurement method (Ballou, 2007). Pakistan is focusing on the carbon-free environment under the Climate Change Act [2008] which will make the energy management more effective and reduce the severe impact of supply chains resulting in the greener environment. Sustainability has turned into a typical point of discourse among policy maker, writers, researchers, journalist and ordinary people. Corporate social responsibility can play vital role in environmental sustainability. CSR has less role in customer retention [Sarfraz, 2014].



Fig. 2. The Three Pillars of Sustainable Development

The word natural means produced by nature, not made or caused by humans. The environment contains both human and non-human elements. All organizations have some human and non-human components, and humans are both products and consumers of natural environments. Driscoll and Starik described the natural environment as encompassing; “The atmosphere, hydrosphere, lithosphere, ecosystems’ processes, and all human and non-human life form. Because of this, the natural environment is seen as a stakeholder entity in the same sense as the local community, the general public, and future human generations”. Hart described the natural environment as biophysical. According to

Hart, the environmental impacts associated with business activities have multiplied. For example, air and water pollution, toxic emissions, chemical spills, and industrial accidents have created regional environmental and public health crises for thousands of communities around the world. The natural environment has a mutually dependent, exchange-based relationship with business organizations. Firms depend on local ecosystems as well as the broader ecosphere for raw materials, plant and microbial Inputs, And Energy.

Linking Sustainability to Supply Chain

It is observed that if the organization adopt sustainability in supply chain management, then it helps to increase the social, economic and financial position of an organization. [Grozniak, Xiong 2012] discuss sustainability and green supply chain management as they both are emerging subject of research. In Sustainable Supply chain management, the economic, environmental and financial performance can be evaluating whereas in Green Supply chain management it entirely depends on the environmental performance of the organization [Zhu, Sarkis 2006].



Fig. 3. GSCM and Sustainability Relationship

That description shows that sustainable supply chain management believes in multiple concepts whereas green supply chain management is part of SSCM as it includes one-factor of SSCM and that is an environment. This comprehension of the connection amongst GSCM and sustainability is similar with the model for feasible supply

management proposed by [Ageron, Gunasekaran, Spalanzani, 2012], in which the green supply network is seen as one of the pieces from which to fabricate a feasible supply management framework. Greening the supply network inside a venture or in a global setting is utilized as a technique to accomplish maintainable improvement. Pakistani banking

sector is considering corporate social responsibility activities [Sarfraz, Qun, Hui, Abdullah 2018].

CONCEPTUAL FRAMEWORK AND METHODOLOGY

The model shows independent and dependent variables of the study. The independent variables are environmental regulation, managerial concerns and stakeholder pressure in the supply chain management department of Pakistani manufacturing industries. The environment is a worldwide issue, and Pakistan sees the rapid change of environment in society due to global warming. Green innovation practices are the dependent variable.

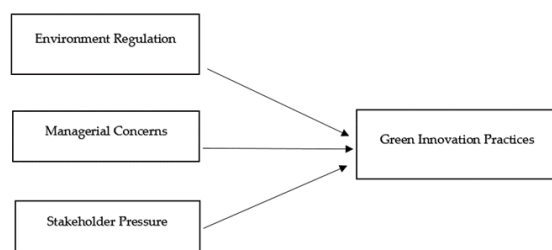


Fig. 4. Conceptual Framework

Hypotheses

- H1: There is a positive relationship between government environmental regulation and the adoption of green innovation practices
- H2: There is a positive relationship between managerial concerns and the adoption of green innovation practices
- H3: There is a positive relationship between stakeholder pressure and adoption of green innovation practices

RESEARCH METHODOLOGY

According to [Sekaran, 2003], different research methods help to answer various forms of questions. Furthermore, [Pettit, Croxton, Fiksel, 2013] described the use of data as synergistic, with qualitative data used to

establish relationships, and uncovering connections achieved from data. The qualitative questionnaire survey method is used in this study. Surveys are a reasonably popular research strategy within business and management research [Bernauer, Engel, Kammerer, Sejas Nogareda, 2006], and there are several possible reasons for this. Firstly, surveys are quite helpful to obtain straightforward information from respondents [Sekaran, 2003]. They enable respondents to clarify their answers to the researchers directly. Secondly, this method provides a cost-effective way for the researchers to obtain data from a large number of samples [Dundas, Lawrie, Rooney, Murray, 2005]. For this study, a questionnaire with 22 questions is used for the survey, and the measurements and data collection.

This study shows stakeholder pressure, managerial concern, and environmental regulation effect on adoption of green innovation practices in manufacturing industries with the avoidance of generalisability. The questionnaire survey was being used to test the hypotheses by collecting a relatively wide range of data. This study's contribution to knowledge lies in its employment of proven techniques in new environments, as well as contributing to the industry by deploying the new framework in the real world amidst the dynamism of reality.

The primary data used in this study comes from questionnaire responses from managers in manufacturing industries that have a profound impact on the environment and located in Pakistan. The questionnaire contains three sections consisting of 22 questions with 4 question related to the general description of an enterprise. The first section is composed of five questions which aim to obtain necessary information about the enterprises, including "how old" the enterprises are, which sectors they operate in and their ISO standards. The remaining two sections are made up of items affecting implementation; namely, the drivers, current practices, and similar outcomes. A convenient sampling, which is one method of non-probability sampling techniques, was done for this research and it was because of the limitations of the availability of the statistical number of manufacturing industries in

Pakistan. The sampling frame of this study comprise the manufacturing industries in the marketplace which are in beverage, clothing, textile, pharmaceutical and biological products, chemistry and chemical and others.

Cronbach's Alpha– to ensure the reliability of the questions and items. The alpha (α) measure will be developed and named by Lee Cronbach in 1951 with the aim of improving further coefficients. In statistics, Cronbach's alpha is a coefficient of internal consistency which can help to describe the extent to which all the items in a test measure the same concept or construct, and to demonstrate the interrelatedness of elements within the test. Thus, it is commonly used as an estimate of reliability within a psychometric analysis for a sample of examinees. However, it is now also widely used in the social sciences, business, nursing, and other disciplines [Sekaran, 2003]. Therefore, the term "item"

could have more meanings, such as questions, ratters or indicators, of which one might ask to what extent they measure the same thing. In this research project, "items" are manipulated as questions in the framework of different Green Innovation items and factors. A five-point Likert-type scale was adopted for the questionnaires.

RESULTS & DISCUSSION

Frequency distribution percentage and cumulative percentage concerning enterprise age have been shown in Table 1. According to Table 1, 9.3% (14) respondent's organization is 1 to 5-year-old. Whereas 12% (18) enterprise is 6 to 10 years, 34.67% (52) organizations are 11 to 15 years old, and 44% (66) enterprises are more than 15 years old.

Table 1. Enterprise Age

Category	Frequency	Percentage	Cumulative Percentage
1-5	14	9.33	9.33
6-10	18	12	21.33
11-15	52	34.67	55.99
More than 15 years	66	44	100
Total	150	100	

Table 2. Manufacturing Sector

	Frequency	Percent	Valid Percent	Cumulative Percent
FMCG	30	19.7	20.0	20.0
Textile	23	15.1	15.3	35.3
Pharmaceutical	27	17.8	18.0	53.3
Paint	27	17.8	18.0	71.3
Chemical	13	8.6	8.7	80.0
Electronics	5	3.3	3.3	83.3
Construction	25	16.4	16.7	100.0
Total	150	98.7	100.0	

Table 2 represents different industries in the manufacturing sector. According to Table, data collected from seven industries related to manufacturing 19.7% (30) respondent were from FMCG industries, 15.1% (23) respondents were from textile industries, 17.8% (27) respondents were from pharmaceutical, 17.8% (27) respondents were from Paint industries, 9.6% (12) from the chemical sector and 8.6% (13) from electronics industries and 16.4% (25) companies are

related to construction who eagerly response to questionnaire.

Factor Analysis

Factor analysis is adopted to analyze the factor loading and cross-loading with the help of convergent validity and discriminant validity. Cronbach alpha and composite reliability are used to identify the internal consistency in variables.

Table 3. Reliability and Convergent Validity

	Cronbach Alpha	Composite Reliability	Average Variance Extracted (AVE)
GI	0.83	0.876	0.541
MC	0.806	0.873	0.632
ER	0.83	0.830	0.550
SP	0.815	0.815	0.596

Table 4. Discriminant Validity

	GI	MC	ER	SP
GI	0.736			
MC	0.613	0.795		
ER	0.730	0.689	0.741	
SP	0.334	0.351	0.286	0.772

Table 3 shows the value of Cronbach alpha of GI = 0.83, MC= 0.806, ER= 0.83 and SP= 0.815. All values are greater than 0.7. The Cronbach alpha value greater than 0.7 shows high internal consistency (Cronbach, 1951). The Composite reliability also shows the internal consistency of variables, and it is the latest version of Cronbach alpha. The composite reliability value greater than 0.7 shows the internal consistency. The table represents the values of composite reliability GI=0.876, MC=0.873, ER=0.830 and SP=0.815.

Fornell Lacker method in the current study calculated validity. The Table shows that the square root of AVE is more significant than internal correlation or inter covariance of another construct. Hence it represents the confirmed validity of constructs.

Simple Linear Regression

Simple linear regression has been applied to check the intensity of variables. The research variables test the separate impact of managerial concern, environmental regulation, stakeholder pressure on green innovation practices by using simple linear regression.

Table 5. Regression Analysis GI and MC

	B	SE	Adj. R square	F	T	P
Constant	1.217	.191	.550	183.137	6.380	.000
MC	.678	.050			13.533	.000

Table 6. Regression Analysis GI and ER

	B	SE	Adj. R square	F	T	P
Constant	1.201	.164	.627	251.491	7.316	.000
ER	.690	.044			15.858	.000

The relationship is significant between GI and MC with p-value .000 and beta value 67% (0.678). It means a one-unit increase in GI will increase 0.678-unit increase in SP. The overall model is a good fit with F value 183.137, and adjusted R² value is 55% (0.550). Therefore, hypotheses H1 has been accepted.

Table 6 represents the intensity of the relationship between GI and ER. The relationship between GI and ER is significant

with p-value .000 and beta value 69% (0.690). It explains that there is a positive and direct relationship between GI and ER. That means a one-unit increase in GI will increase 0.690-unit increase in ER. The overall model is a good fit with F value 251.491, and adjusted R² value is 62% (0.627). Therefore, hypotheses H2 has been accepted.

Table 7. Regression Analysis GI and SP

	B	SE	Adj. R square	F	T	P
Constant	2.468	.288	.116	20.599	8.579	.000
SP	.343	.076			4.539	.000

The intensity of the relationship between GI and SP has been shown in table 7. The relationship between GI and SP is significant with p-value .000 and beta value 34% (0.343). It explains that there is a positive and direct relationship of GI and SP. That means a one-unit increase in GI will increase 0.343-unit increase in SP. The overall model is a good fit with F value 20.599, and adjusted R² value is 11% (.116). Therefore, hypotheses H3 has been accepted.

CONCLUSIONS

The study shows a significant impact of manager's concern, environmental regulation, and pressure of stakeholders in the adoption of green innovation policies. These variables are the most fundamental, primary and primary drivers for the organizations to adopt green innovation practices, especially in supply chain management. The more noteworthy significance given to managers in adopting green innovation practices depend on the organization tendency to accept these practices in the manufacturing department. Stakeholder pressure and environmental regulation also have a significant impact on applying green rules and policies. Consequently, management concerns, regulations and stakeholder pressure are fundamental and essential components of the effective decision making.

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DRIVERY ZIELONEGO ŁAŃCUCHA DOSTAW

STRESZCZENIE. Wstęp: Przedsiębiorcy działający w obszarze produkcji często spotykają się z problemem redukcji efektów środowiskowych procesu produkcyjnego. Jest to istotny problem, wymagający szybkiego rozwiązania, uwzględniającego zarówno zagadnienia zarządzania, kontroli czynników środowiskowych jak i interesów udziałowców. Niemniej jednak czynniki związane z zarządzaniem i wielkością firmy wyróżniają się krytycznym wpływem na wybór stosowanych innowacji ekologicznych. Celem pracy było zbadanie wpływu tych czynników na producenta we wprowadzaniu ekologicznych innowacji.

Metody: Dane zostały zebrane w ujęciu ilościowych, poprzez przeprowadzenie ankiety wśród 150 przedsiębiorstw produkcyjnych. Do analizy danych zostało użyte oprogramowanie Statistical Package for the Social Sciences (SPSS) we wersji 23. Użyte analizy to analiza liniowa, korekta oraz analiza KMO.

Wyniki: Wykazano wpływ metod zarządzania na wybór praktyk ekologicznych. Stwierdzono istotne zależności pomiędzy regulacjami prawnymi, presją wywierającą przez udziałowców oraz wielkością przedsiębiorstwa na wybór innowacji ekologicznych.

Wnioski: Praca pokazuje elementy mające wpływ na zaadoptowanie zielonych innowacji w łańcuchu dostaw przedsiębiorstwa produkcyjnego. Proekologiczne zarządzanie jest istotne dla rozwoju zrównoważonego przedsiębiorstwa. Zielone zarządzanie łańcuchem dostaw jest nadal w fazie rozwojowej w Pakistanie. W pracy zidentyfikowano kilka czynników mających istotną rolę w adoptowaniu zielonego zarządzania w łańcuchu dostaw. Praca wspomaga rozwój polityki proekologicznej i lepsze zrozumienie wprowadzania zielonych innowacji w praktyce.

Słowa kluczowe: zielone innowacje, zarządzanie łańcuchem dostaw, środowisko zielonego zarządzania zmianami w zaopatrzeniu, rozwój zrównoważony, Pakistan.

EINFLUSSFAKTOREN DER GRÜNEN LIEFERKETTE

ZUSAMMENFASSUNG. Einleitung: Die im produktiven Bereich tätigen Unternehmen kommen sehr oft mit dem Problem der Reduzierung von Umweltschutz-Effekten innerhalb des Produktionsprozesses in Berührung. Das ist ein wesentlicher Schwerpunkt, der eine rasche Lösung erfordert, wobei sie gegebenenfalls sowohl die Fragen des Managements, der Kontrolle von Umweltschutz-Faktoren als auch die Interessen beteiligter Teilhaber berücksichtigen muss. Allerdings beeinflussen die mit dem Management und der Firmengröße verbundenen Faktoren in kritischer Weise die Auswahl anzuwendenden ökologischen Innovationen. Das Ziel der Arbeit war es, die Einflussfaktoren bei der Einführung von ökologischen Innovationen seitens des Produzenten zu ermitteln und zu bewerten.

Methoden: Die Daten wurden im Rahmen eines quantitativen Vorgehens anhand einer in 150 Produktionsunternehmen durchgeführten Fragebogen-Untersuchung erfasst. Für die Zwecke der Analyse der gewonnenen Daten wurde das Programm von Statistical Package for the Social Sciences (SPSS) in der 23er Version angewendet. Die dabei in Anspruch genommenen analytischen Tools waren: die lineare Analyse, die Korrektur und die KMO-Analyse.

Ergebnisse: Es wurde ein Einfluss von betriebenen Management-Methoden auf die richtige Auswahl von ökologischen Innovationen und Praktiken aufgezeigt. Dabei wurden wesentliche Zusammenhänge zwischen gesetzlichen Regelungen, dem von den Teilhabern ausgeübten Druck und der jeweiligen Firmengröße als Einflussfaktoren bei der Auswahl entsprechender ökologischer Innovationen festgestellt.

Fazit: Die Arbeit zeigt die Elemente auf, die einen gewichtigen Einfluss auf die Einführung von grünen Innovationen innerhalb der Lieferkette eines Produktionsbetriebes ausüben. Das pro-ökologische Management ist durchaus relevant für die nachhaltige Entwicklung jedes Produktionsunternehmens. Das grüne Lieferketten-Management befindet sich in Pakistan noch in einer Entwicklungsphase. Im Rahmen der vorliegenden Arbeit wurden einige Einflussfaktoren, die eine wesentliche Rolle bei der Einführung des grünen Lieferketten-Managements spielen, identifiziert. Sie vermag also die Entwicklung der pro-ökologischen Wirtschaftspolitik zu unterstützen und ein besseres Verständnis für die Einführung von grünen Innovationen in die Praxis herbeizuführen.

Codewörter: grüne Innovationen, Lieferketten-Management, Umfeld eines grünen Managements von Veränderungen in der Versorgung, nachhaltige Entwicklung, Pakistan.

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