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Computer System Users are like Fish

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Abstract This paper has looked at the habits of computer users when faced with a slow system and has drawn a direct correlation between how they react and fish population dynamics. A survey has been presented that supports the proposed theory.

Keywords: *systems, performance*

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1. Introduction

This paper addresses the reactions of computer users when faced with a slow system. A correlation can be drawn between what a user does and fish population dynamics. In order to accomplish this, it is important to understand the connection between drivers and their impacts on fish populations [1]. This paper will prove useful to system stakeholders on how to improve their user's experience.

Slow systems

For many system users, slow systems are the norm. There are many components that go into making up a system: The server hardware, operating system, applications, the network and all of its components, the desktop, and the users operating system and applications. A slowdown in any one of these components could negatively affect the users response time.

Population dynamics

Population dynamics looks at entire populations and studies short and long-term changes to their composition. These changes could include size, age, make-up, or density. Additionally, population dynamics studies factors that affect the growth, stability, and decline of populations as well as the interactions of these factors.

Usefulness

System owners and readers who perform a system administration function will benefit the most from this paper. This paper attempts to explain how users might react when they log into a busy system.

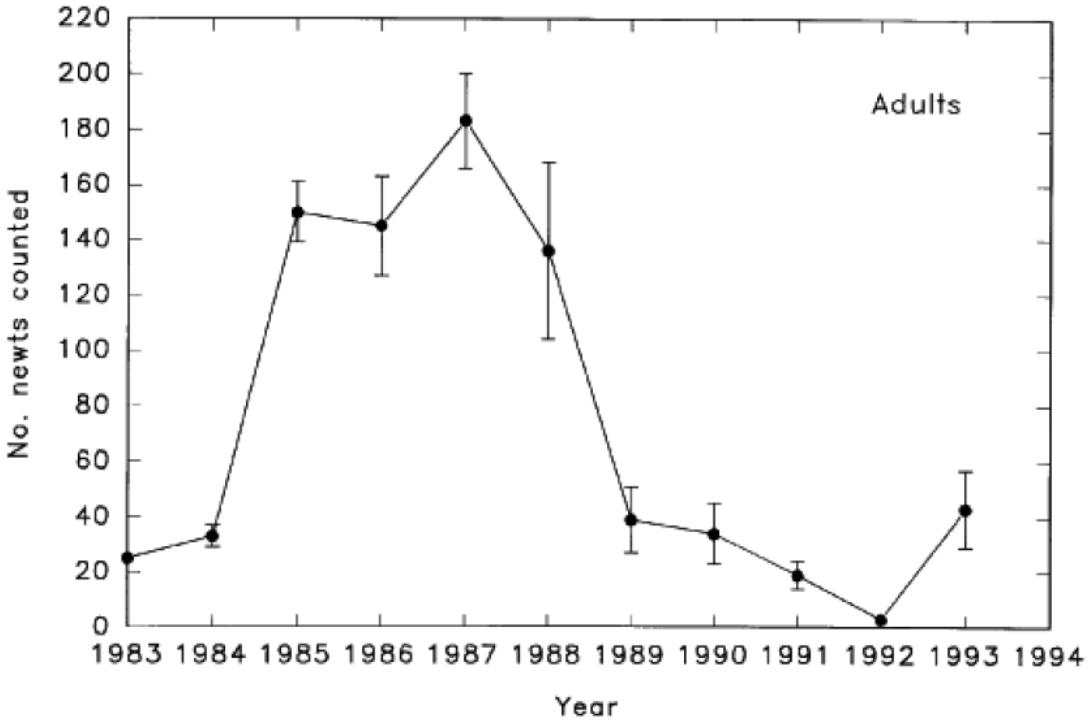


Figure 1.

2. Fish Population Dynamics

A given pond size can only sustain a certain amount of fish. If a pond only has a few fish in it, the fish will sense this and since there is no stress on them, they will begin to reproduce. As long as there continues to be little or no stress on them, they will continue to reproduce. Eventually, they will reproduce until they cannot move around comfortably, run low on food, or the oxygen drops to an unacceptable level. When the fish reach this point, several things can happen. The fish might stop reproducing, older fish may voluntary die off, or more mature fish might start eating younger fish in order to get to a level where there is less stress on them Eventually, the fish population will drop. The fish will detect this drop in population; the resultant drop in stress, start to reproduce again and the cycle will start over. According to [2], populations respond to environmental conditions.

Figure 1 shows the natural population dynamics of adult newts in their natural habitat for the years 1983 to 1994. As can be seen in the figure, the population grows until it hits a maximum number in 1987, then the population declines from 1987 to 1992 only to pick back up again starting in 1992 [3].

3. The Survey

The survey this paper used was conducted at a major university in Philadelphia, PA during the 2012 academic school year. A total of 32 students were surveyed. They ranged in age from 24 to 62 and were either in their junior or senior year. Four of the students were female.

Institutional Review Board approval was not required since this survey in no way impacted the student's grade or adversely affected the students in any psychological manner. This population was chosen as a matter of convenience and not tied to the fact that they were students.

4. The Survey Instrument

Each student was asked to fill out a survey. The survey tried to measure how they reacted in the past when they logged into a slow system. The instrument consisted of eight questions. The first two questions collected demographics asking age and gender. The survey in no way attempted to correlate age or gender to the results. The survey instrument is included in Appendix-A.

5. Survey Results

Questions #2 and #3 were the crux of the survey.

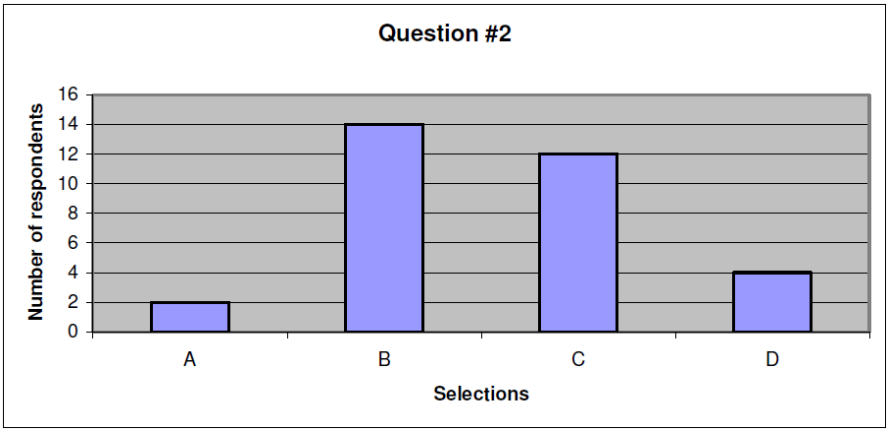
#2 When you were logged into a system, and it was busy, how did you react?

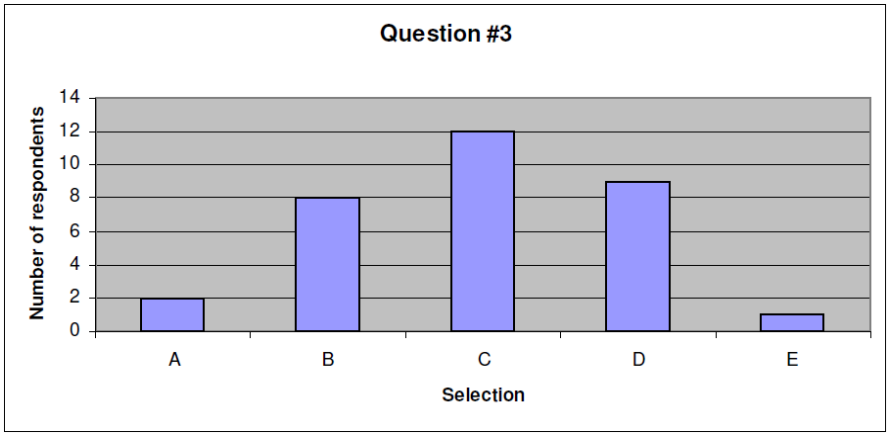
a. I logged off and didn't try to login again.
b. I logged off, but tried again later.
c. I stayed logged in and waited it out.

#3 If you logged off, how long did you wait before trying again?

a. Right away.
b. One minute or less.
c. Five minutes or less.
d. One hour or less.
e. More than one hour.

The following shows the responses from the survey:





Users are like fish

Population structuring (growth and depopulation) is a behavioral response learned by fish early in their life [2]. Population dynamics are sensitive to changes in the environment [2]. The following is a model that can be used to calculate the population of a system after users start to logout:

Depopulation rate:

$$Dr=100\left[\frac{(N_0 - N_1)}{N_0}\right]x100$$

Where:

N_0= the initial population size

N_1= the ending population size

Let's use the following as an example:

$N_0 = 500$

$N_1 = 300$

Depopulation rate:

$$Dr=100\left[\frac{(500 - 200)}{500}\right]x100$$

Dr = 100 – (.4) x 100

Dr = 60%.

6. Application

The easy answer to fix a slow-down problem is to monitor resources and increase bandwidth and server processing capability as needed. However, this approach is rarely available today as budgets are shrinking. Monitoring is always a good practice and fairly inexpensive to do. If after monitoring, it is determined that there is a network congestion problem, traffic shaping is always an option. By applying Quality of Service (QoS) rules to the network, priority can be given to specific traffic and improve response time. QoS is a cheap way to improve response time. Alternatively, the network can always be subnetted.

If the problem is on the server, then implementing a time-out policy for connections not being used will free-up connections and improve response time. This would stop users from "parking", a practice used by many users where they log into a system early in the morning and maintain the connection throughout the day, using it only when needed. This ties up connections and typically slows down a system.

7. Conclusion

This paper has connected fish population dynamics to how users react when logged into busy computer systems. A survey was conducted that supports this theory. The bottom line is that resources are not unlimited today. However, we if we understand users habits and reactions, it may help make informed decisions and improve the user experience.

References

[1] Eero, M., Lindegren, M. & Koster, F. (2011). The state and relative importance of drivers Of fish population dynamics: An indicator-based approach. *Ecological Indicators 15* (2012) 248-252.

[2] Kerr, L., Cadrin, S., & Secor, D. (2010). The role of spatial dynamics in the stability, Resilience, and productivity of an estuarine fish population. *Ecological Applications, 20*(2), 2010, pp. 497-507.

[3] Griffiths, R.A. (1997). Temporary ponds as amphibian habitats. *Aquatic Conservation: Marine and Freshwater Ecosystems, Vol. 7*, 119-126.

Survey

Age: _____

Gender: Male - Female

1. Have you ever logged into a system and it was extremely busy? (If no stop here. If yes, continue to #2)
2. When the system was busy, how did you react?
   a. I stayed logged in and waited it out.
   b. I logged off and tried again later.
   c. I logged off and didn't try again.
3. If you logged off, how long did you wait before trying again?
   a. Right away.
   b. One minute or less.
   c. Five minutes or less.
   d. One hour or less.
   e. More than one hour.
4. What would have helped your experience?
   a. A message stating it was "working"?
   b. A message telling you to log off and try later?
   c. A message telling you how busy the system is?
   d. No message, I knew what was happening?
5. Have you ever been told not to log into a system because it is busy processing data and you might impact the processing? Yes - No
6. Do you work fulltime? Yes - No

Note: Do not write in any answers. Only circle one answer.